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Reliability of Supply

GREAT importance has always been attached to reliability in the public supply of electricity in this country. British engineers have sometimes been criticised by foreign observers for making a fetish of it, but we believe that the policy will be justified in its results. To many industries continuity of supply is of considerably more moment than cheapness, but in securing them as consumers on the basis of a reputation for the first, we are able to achieve the second in an ever-growing degree.

On the other hand a bad breakdown may undo the effects of much patient negotiation and expensive propaganda, especially among those who rely on electricity for preparing their meals and for heating and lighting their homes, and every reasonable step should be taken to ensure a service that is as regular as it can be made.

How far have recent technical advances been in the direction of increased reliability? There is ample evidence about us that design is well in advance of the load and that modern plant and mains are, as a rule, able to bear the increasing stresses of dealing with an output that has been trebled during the last ten years.

So much for the newer developments. But older plant must be retained so long as it can be efficiently used, and many of the less modern generating stations, whether selected or not, have several years of useful service before them as distributing centres. These will need modification, chiefly in view of the greater power available behind a short-circuit nowadays.

In deciding what modifications are the most pressing, supply engineers are handicapped by lack of full details of the experience obtained by other undertakings in dealing with troubles that inevitably arise from time to time. Failures occur, but little is reported about them. There is no clearing house for the large store of accumulated practical knowledge of the kind that the Electricity Commissioners presented in their recent report on the effects on overhead lines of the blizzard last February.

Much may be learned also from the recent unfortunate interruption of supply from Willesden generating station, of which Captain J. M. Donaldson has given us the particulars reported on another page. This station has been selected for grid operation and is a good type of the pre-Brimsdown "B" era and thus provides a strong *a fortiori* argument for investigating the suitability of apparatus at other stations to meet modern conditions, however good their record may have been in the past. Thus at Willesden the oil-immersed current transformers with wound primaries, which were so much of an improvement upon their predecessors, were being replaced by those of the compound-filled ironclad type when one of those remaining went down and did the damage.

Large sums of money could be spent, probably in vain, in trying to secure 100 per cent. reliability; but frank disclosure and co-ordination of information would make it considerably easier to secure, so far as practicable, the same degree of immunity from major cessations of supply as we may expect from the most modern equipment.

American Failure

IT was never quite clear to English minds why the National Electric Light Association was superseded by the Edison Electric Institute. We watched the proceedings and reviewed them in these pages in the hope that something of a helpful nature might emerge of which we could make use in our efforts to revise British electricity supply organisation. Possibly President Roosevelt's National Recovery measures peremptorily demanded the almost complete and immediate attention of the electrical industry and utility interests. But whatever the cause may be there is striking discontent in the American Press with the present lack of cohesion in the industry, which is stated to be causing a deterioration in the morale, as well as in the competency, of individuals in the utility business. There is more than a tone of regret that where there was once organised compilation and dissemination of practical information as well as organised efforts to develop business, and opportunities of interchange of experiences and opinions, there is now a great need for them. The old N.E.L.A. may have overdone some

of its activities, but it is recognised now that much of its committee work was good and should not have been discarded. Engineers, commercial men, accountants and executives admit the failure of the new policies.

Woman's Work

A RECORD received of the work of the Electrical Association for Women during the month of November is impressive. The autumn and winter period seems naturally to provide the best opportunities for the exercise of the organisation's numerous and varied activities both within its own membership and outside amongst others in search—or at any rate in need—of electrical knowledge. Included in the subjects that figured in its proceedings somewhere or other during the month, were the following:—The design and performance of domestic appliances; smoke and home; work, worry and fatigue relieved electrically; co-operation of the E.A.W. with E.D.A.; training problems; teachers' housecraft lectures on electric lighting principles, refrigeration, electric warming and cooking, and the use of small appliances. In addition there were many gatherings with non-electrical associations about electrical matters, various social events, as well as works and showroom visits.

A.C. Clocks on D.C. Mains

IT will be a new point to some readers that a.c. synchronous clocks can be operated from d.c. mains. This is done by taking advantage of the third harmonic of an a.c. supply that has been converted by mercury rectifiers. The effect of trebling the frequency is to raise the speed proportionately, thus entailing the use of reduction gearing; a small transformer is also needed to compensate for the low ripple voltage and the increase in the impedance of the clock coil. While there are probably not enough people using rectified supply to encourage the production of a special model, the point is more than academic, since, as reported on a later page, such clocks are running synchronously from the d.c. mains at Plymouth dockyard. The satisfactory continuous operation of standard 230-V models at 600 V speaks well for the insulation.

An Eye to the Future

IT is reported from Southport that the Corporation has offered to supply electric cookers of the latest pattern to domestic education centres in the town free of charge if the education authority provides the necessary wiring and control boards. These cookers will be replaced by later models as they become available for a nominal charge of £1. This is an astute move on the part of the Electricity Department, for by thus bringing up the future consumers in the right way it should eventually reap a rich harvest. As the Corporation also owns the gas undertaking its action is all the more commendable—unless, of course, it is also supplying gas cookers on the same terms.

Loading the Lines

THE progress made in securing contracts for industrial loads during the first year of the Pykara hydro-electric scheme is encouraging. Mr. H. G. Howard, chief engineer for electricity to the Madras Government, anticipates that the financial results estimated in the original report as obtainable in the tenth year will be achieved in the sixth year from the start of supply. This, he says, is in spite of a lower average revenue per kWh than that originally allowed for, owing to reduced tariffs. Experience of British conditions suggests that "because of" should be substituted for "in spite of." Mr. Howard has killed two birds with one stone by inducing industrialists to sell him their oil engines cheaply and by installing them temporarily in outlying districts. By the time that the h.v. transmission system has been extended there he will have distribution systems, complete with loads, waiting to bear their share of the expenditure on the lines, a method of which more advantage might have been taken in this country.

Interesting the Architect

SOMETHING under a year ago a joint Committee was formed under the auspices of the Royal Institution of British Architects, the Architectural Association, and the Electric Lamp Manufacturers' Association as a means of bringing architects and electrical illumination engineers together to discuss matters of common interest. Under this Committee's ægis a series of conferences on electric light in its application to architecture were arranged during last spring. These were so successful that a further series has been arranged for the first quarter of the coming year. The subjects for discussion include church, shop and industrial lighting, general illumination principles, and the architectural design of facilities for lighting.

The Engineering Return

A NEW Return of Engineering and Financial Statistics relating to authorised supply undertakings has been issued by the Electricity Commissioners. It is a mine of useful and well-compiled data, though more attention might well have been given to the consuming side. The present volume is similar in arrangement to its predecessors, but next time the information given is to be amplified as a result of a conference with the principal associations concerned with electric supply. The ELECTRICAL REVIEW has contained many suggestions for enhancing the utility of this publication, but we hope that the additional data required from undertakings will not delay their replies still further than at present. A year and seven months is an unconscionably long time to be behind.

Generation in November

THE generation of 1,420 million kWh in November by statutory supply undertakings means an increase of 15.4 per cent. on November of last year, the number of working days being the same. It brings the figure for the first eleven months of this year to 12,018 million kWh, which is 9.5 per cent. above that for the corresponding period of last year and only 230 million kWh short of the total figure for 1932. If the same progress is maintained this month the rate of increase for the year will be very nearly 10 per cent., and the total increase in kWh will exceed that of the "high spot" of 1929.

The Low Secondary Rate

THE old question of why the charges for electricity cannot be based (as they are for water) upon assessment of property was raised by the Lord Mayor of Liverpool at the recent dinner of the Mersey and North Wales Centre of the I.E.E. While some approach has been made to this position in the two-part tariff, it is difficult for the layman to understand—even if he appreciates that the running charges on water are almost negligible—the magnitude of the kWh charge in some areas, which is supposed to cover only coal and a small proportion of the repairs and wages that vary with the output of the generating station. Often it is held that consumers prefer to pay part of the standing charges as an addition to the running charge, and they do not want to be troubled with supplements occasioned by small increases in fuel cost. With the low secondary charges offered under the grid tariff (which are the best incentives to increased consumption), Ferranti's ideal of a universal charge of ½d. per kWh, coupled with a primary charge varying with local circumstances, should soon be achievable.

How to Reduce Unemployment

AN immediate outcome of the new electrification schemes of the Southern Railway, mentioned here last week, is the placing of a contract for cable and accessories to the value of £200,000 with the Pirelli-General Cable Works, Ltd. This will give work at the company's factory at Southampton extending over twelve months. Other recent contracts have already added three hundred to the employment roll, and further hands are likely to be taken on. Other railways please copy!

Lavish Decorative Lighting in the Cumberland Hotel. **(See Next Page)**

(1) Indirect lighting on wall panels between doors of the Centre Court. (2) The Cumberland Restaurant. (3) Lifts and Oxford Street entrance. (4) The Cumberland foyer. (5) Grill room (close-up of lighting fittings). (6) Grill-room foyer. (7) One of the ladies' hairdressing cubicles. (8) The cocktail bar. (9) Gentlemen's hairdressing saloon

A Modern Hotel Installation

THE new Cumberland Hotel, Oxford Street, W., was opened by Messrs. J. Lyons & Co., Ltd., this week. It is very lavishly decorated on ultra-modern lines, and electric lighting plays a most important part in this aspect of the new building. Rare timbers and special glassware and metalwork have been extensively employed in the decoration scheme, the credit for which goes to Mr. Oliver P. Bernard, L.R.I.B.A., the architect-designer.

In the public and service rooms and generally in other large apartments tubular lighting forms the basis of the general scheme, each room and section having its own definite design conforming with the architectural characteristics. The tubular

One of the motor drives for the ventilating and air-conditioning plant

equipment was supplied by Messrs. Maple & Co., Ltd., and the General Electric Co., Ltd., and an outstanding feature is the unusual extent to which curves and bends are employed.

Much of the tubular lighting has been installed because of the call for continuous runs of soft shadowless and diffused illumination with warm and coloured effects. Mr. P. King-Morgan (of Messrs. Maple's) told us that the coloured lighting is effected in many instances by the use of natural coloured glass for the actual tubes.

In the centre court (residents' lounge) there are three rings of tubular lighting, about 10 ft., 11 ft., and 12 ft. 6 in. in diameter respectively, employing 4-ft. tubes of 40 mm. diameter with pink natural glass. In this lounge the tubular lighting is supported by some "Sun-Ray" neon lighting supplied by Claude-General Neon Lights, Ltd., and the bulk of the lighting other than tubes in the public rooms is mainly by laylights, recessed equipment and wall fittings.

Falk, Stadelmann & Co., Ltd., and the Franco-British Electrical Co., Ltd.; special between-bed lighting fittings with two hinged doors were purchased from the General Electric Co., Ltd.; and floor standard lamps for the private sitting-rooms were obtained from Woodfyt Sales, Ltd.

A "Keepalite" system with a 240-Ah battery, supplied by Hart Accumulator Co., Ltd., serves a system of secondary lighting. Outside, the top portion of the front elevation is floodlighted white, and the three main porticos are similarly illuminated in colour. In all there are 133 floodlight projectors supplied by the Edison Swan Electric Co., Ltd.

The Ventilating System

Perhaps the most interesting feature of the electrical installation from the general engineering point of view is the ventilating and air-conditioning system installed by the Carrier Engineering Co., Ltd., and designed to change the air entirely throughout the hotel at frequent periods. This employs forty-five fans, each of which is driven by a motor produced by Messrs. Crompton Parkinson, Ltd., who also supplied many motors for washing-up equipment, refrigerating plant, vacuum cleaners, and boiler-house auxiliaries. Most of the motor starters were supplied by the Igranic Electric Co., Ltd.

There are three high-speed (500 ft. per min.) passenger lifts, each capable of carrying twenty passengers, and ten small service lifts, all supplied by Waygood-Otis, Ltd., and six high-speed goods lifts installed by the Express Lift Co., Ltd.

In the private sitting-rooms we saw some attractive inset fires, supplied by Messrs. Bratt, Colbran & Co., Ltd., and switch-plugs serving these and other equipment were made by M.K. Electric, Ltd., and the Wandsworth Electric Manufacturing Co., Ltd. "Niphan" plugs employed for lighting dimmers in the public rooms were supplied by Messrs. Simmonds & Stokes, Ltd. In the kitchens there are several large bain-maries produced by the Jackson Electric Stove Co.

Other equipment, all playing an important part in the general make-up of the installation, includes indicators in the hairdressers' departments, supplied by Messrs. D. H. Bonnella & Sons, Ltd., and Messrs. Julius Sax & Co., Ltd.; cable hangers by Constructors, Ltd.; switches by Messrs. J. A. Crabtree & Co., Ltd.; fuseboards by Messrs. G. P. Dennis, Ltd.; interphones by Dictograph Telephones, Ltd.; cable by the Hackbridge Cable Co., Ltd.; bells and transformers by Messrs. Julius Sax & Co., Ltd.; special switches and pushes by Messrs. A. P. Lundberg & Sons, Ltd.; an entire system of electric clocks and also staff recorders and time stampers by the Magnetic Time Co., Ltd.; distribution switchgear by the Midland Electric Manufacturing Co., Ltd., and the Vincent Switchgear Manufacturing Co.; main switchgear by the Metropolitan-Vickers Electrical Co., Ltd.; about 1,000 relays and door locks for the bedroom signalling system by Messrs. Wm. McGeoch & Co., Ltd.; a similar number of buzzers for the same system by the Phœnix Telephone & Electric Works, Ltd.; switch-plates, &c., by Roanoid, Ltd.; over 330,000 ft. of welded con-

The parlour and the centre court of the new Cumberland Hotel

Of the more utilitarian lighting equipment artistic bedroom shades were supplied by Aladdin Industries, Ltd.; Messrs. Best & Lloyd, Ltd., supplied various fittings for the lavatories, staircases and cloakrooms, &c.; and "Striplite" lamps incorporated in revolving doors, and floor signal lamps were obtained from British Electric Lamps, Ltd. Lamps were supplied by Crompton Kye Lamps Sales, Ltd., and the G.E.C.; staff-room fittings and corridor signs were supplied by Messrs.

duit and fittings and accessories and fuseboards by Walsall Conduits, Ltd.; and contactor gear for the lift equipment by Messrs. Whipp & Bourne, Ltd.

The total installed lighting load is over 500 kW, and the total h.p. of motors in use is about 1,300. Electricity is received from the St. Marylebone Borough Council at 6,600 V, and is transformed on the premises to 415 V, three-phase. There is a supplementary supply from the London Power Co.

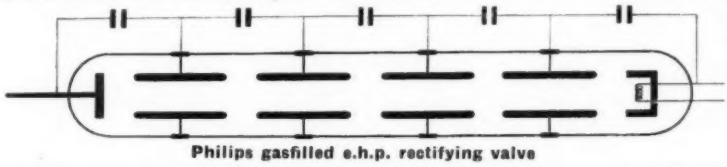
The Radiological Exhibition. By C. Morgan Davies, A.M.I.E.E.

A critical review of the apparatus seen at the Central Hall

NOW that we are recovering from the attack of mental indigestion following the recent exhibition of apparatus held in conjunction with last week's annual congress of the British Institute of Radiology, certain impressions emerge clearly.

In the first place, there is no doubt that most of the manufacturers are making vigorous efforts to improve the general standard and performance of apparatus. Progress is indicated in such things as mechanical design, the application of electric drives to couches, the extended use of remote controlled gear and the provision of efficient automatic protective devices and electrical interlocks. These are all steps in the right direction.

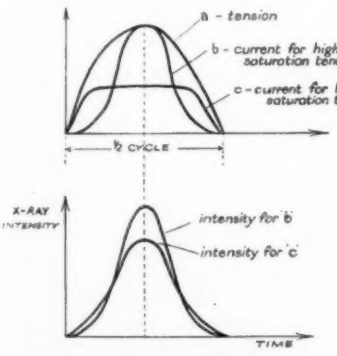
There is still much difference of opinion regarding the type of equipment best suited to modern requirements, varying ideas concerning the maximum outputs necessary causing much discussion, and we are far removed from anything approaching standardisation. As a result of this a wide range of apparatus with greatly varying characteristics is offered, and claimed to be suitable for almost any requirement. Thus, in the absence of expert advice, the purchaser is faced with a difficult problem when trying to make the correct selection. The manufacturer is not entirely to blame for this, considering that the purchaser is usually devoid of even a smattering of engineering principles and is full of bright ideas. Thus, often in conflict with his better judgment, but anxious to secure the order to help keep his head above water he makes a genuine effort to satisfy the whims of personal idiosyncracy. Close co-operation between all concerned, the pooling and sifting of ideas, and a common research organisation would do much to remedy this state of affairs.



Philips gasfilled e.h.p. rectifying valve

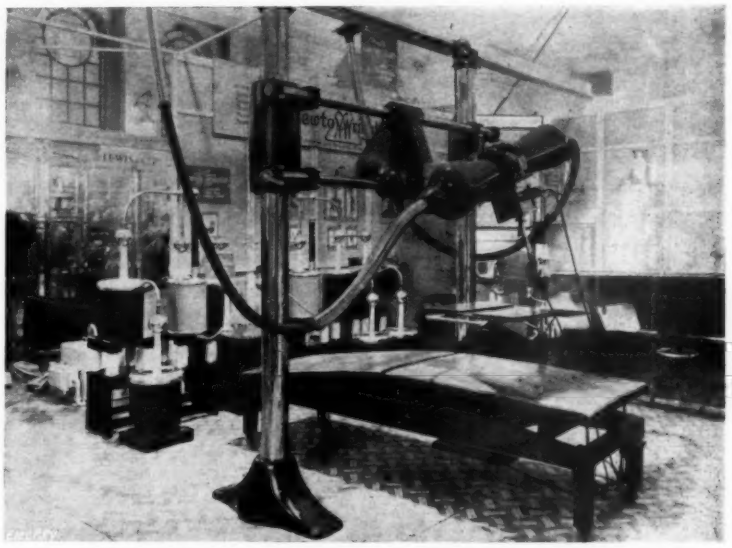
In the field of therapy much activity prevails, there being several plants offered and important and interesting developments pending. The apparatus under this heading appears to be a little nearer standardisation. Two main types are general, one employing a gantry type stand in conjunction with shockproof cables and tube, the other incorporating the now familiar "Cannon" built on to the high-pressure unit.

Diagnostic units may, broadly speaking, be divided into three classes: (a) High or moderate output sets feeding a number of X-ray tubes through a h.p selector switch, (b) low output sets built on the unit system; and (c) mobile equipments. Some of the exhibitors appear to be concentrating upon the development of the unit system, which provides a small self-rectifying transforming plant with each piece of diagnostic apparatus. This system undoubtedly offers many attractions as it enables each unit to operate independently, thus avoiding the dislocation of work consequent upon the breakdown of a central transformer. Further, it simplifies the layout of a department and eliminates the h.p. distribution system.



Philips tube characteristic

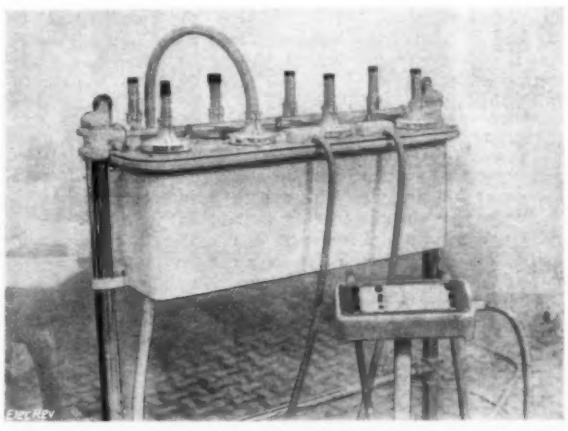
It is claimed that the improved characteristics of the new tubes, combined with the further shortening of exposure times rendered possible by the latest intensifying screens, permit the application of these sets for all purposes other than long-distance chest radiography. These statements need careful consideration if the best results accompanied by a minimum film bill are desired. The ratings vary from 10 to 35 mA at pressures up to 90 kV peak. Exposure times of 3½ seconds for



Newton & Wright deep-therapy unit

subjects such as ante-natal cases are quoted as remarkable, but when one considers the impossibility of immobilising the object in such cases, exposures of the order of one second or less would seem more desirable. It must also be remembered, if the progressive radiographer is not to be hampered, that a good equipment of instruments and a wide selection of factors must be provided. It is still difficult to obtain accurate data concerning such things as output and voltage regulation and one hears conflicting reports regarding the suitability of three-phase units for radiographic work.

Insulation of the whole of the h.p. circuit is now standard, shockproof equipment being in evidence everywhere. We have only one regret in bidding farewell to the troublesome rheophore; it did allow of extremely easy movements of the tube, whereas the lesser flexibility and greater weight of the earth-shielded cables tend to hinder movement and impose greater strain upon the tube carrier. A reduction in weight and diameter is looked for. In addition to this the cross-sectional areas of the conductors carrying current for heating the filaments of high output tubes need attention, unless high voltage drop is to occur. The provision of adequate protection for the radiologist from scattered radiations during screening operations deserves more attention.

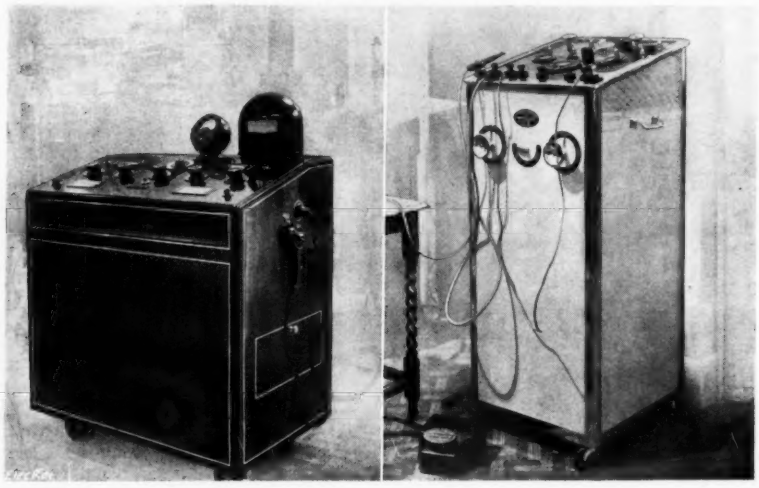


The Schall oil-immersed h.p. switch

The output of modern high-power apparatus is at present limited, due to the restrictions imposed by tubes and valves. Philips Lamps, Ltd., have again made several important con-

tributions towards the removal of this disability. One of the most interesting is the new e.h.p. gasfilled rectifying valve (shown diagrammatically), which utilises the rectifying properties of mercury vapour in conjunction with the emission from a dull-emitter filament, consuming only 7 W. The potential across the valve is split up by a series of condensers connected to tubular electrodes, each of which contains a small quantity of mercury. Upon switching on a fall of potential of 3 kV occurs, this rapidly decreasing to 40 V, at which value it remains practically constant up to the maximum current rectified (1,000 mA). The construction makes use of the Philips patent glass to metal seal, the condensers being of tubular formation and placed around the assembly. This results in a simple and compact component of small dimensions.

Another new product is a diagnostic tube having a restricted emission at low voltage values, current only flowing at the higher voltages. This results in a greater blackening of the



Left: Watson's " Quatralix " apparatus. Right: " Marconi-Dean " diathermy machine

film for a given mean current, other factors being equal. For therapy there is a new three-electrode tube, the biasing of the third electrode producing similar characteristics to the last mentioned. Further, there is a tube rated for continuous operation at 4 mA, 400 kV peak. All types are suitable for shockproofing.

Mr. Cuthbert Andrews has improved his range of " Protexray " tubes by new designs and the introduction of a neat shockproof model of small dimensions. The latter has been achieved by correct shaping of the outline together with the introduction of insulating oil between the inner tube and the metal casing. Connecting cables of reduced diameter also contribute to increased flexibility and ease of movement. The standard air-cooled tube has been improved by the introduction of air ducts at right angles to the radiator fins, these permitting efficient cooling in both the vertical and horizontal positions.

The Victor X-Ray Corporation solves the problem of cooling its therapy and diagnostic tubes by means of oil circulation. The General Radiological and Surgical Apparatus Co. provides a complete range of " Multix " tubes, shockproofing of the standard diagnostic sizes being afforded by the " Tuto " shield. This is well constructed and of pleasing appearance, the connecting cables being led in from above or below the centre, thus reducing the overall length.

A Compact X-Ray Unit

Messrs. Watson & Sons (Electro-Medical), Ltd., attracted much attention by the exhibition of the " Quatralix " four-valve unit (illustrated). This apparatus incorporates the new gasfilled valve already mentioned, and in addition presents many novel and useful features. It is a departure from orthodox design inasmuch as it houses a complete h.p. and control unit of moderate output in a compact and movable cabinet.

An interesting feature is the adoption of a new method of loading the X-ray tube during short exposures and known as the " decreasing tube charge " system. This involves the automatic application of a momentary boost in the filament circuit, prior to the application of the exciting voltage. As a result of this the anode receives the maximum amount of energy at the commencement of the exposure, when it is cold, the load then diminishing as the temperature of the target rises, until the timer breaks circuit. It is claimed that this method effects a reduction in exposure time of 40 per cent. compared with the " constant rate " method of loading. A thermionic valve timer provides accurate control of the exposure period, this being adjustable from 0.4 sec. to 8.0 seconds in equal steps. The maximum output is about 200 mean mA at 110 kV peak.

A motor-operated tilting couch of clean design and fitted with a self-rectifying transforming unit also evoked favourable comment. Electrical interlock safeguards against collision between the couch and the tube when tilting and bold dial indicators enable the operator to read tube angle and distances at a glance. Other exhibits worthy of mention are a new therapy unit and a short-wave valve-operated diathermy apparatus.

Messrs. Newton & Wright, Ltd., displayed a deep therapy unit utilising the Villard pulsating tension circuit and shown in conjunction with a " Metalix " shockproof tube mounted on a gantry type stand (illustrated). The apparatus is designed to operate at 8 mA 200 kV peak, provision having been made for operation at 300 kV peak if required. The potential is adjusted by means of a remote-controlled motor-driven regulator which provides continuous stepless variation of voltage and is operated from a neat and simple control table. In the event of failure of the tube cooling system the supply of energy is automatically cut off.

A novel scheme is adopted to define the area it is desired to irradiate, whereby a simple optical system is used to project a beam of light coincident with the X-ray beam from the tube. The tube stand is well constructed, nicely balanced, and provides free movements of the tube in all directions. A working model of a new universal pattern motor-driven tilting couch was also exhibited.

A Tube Selector Switch

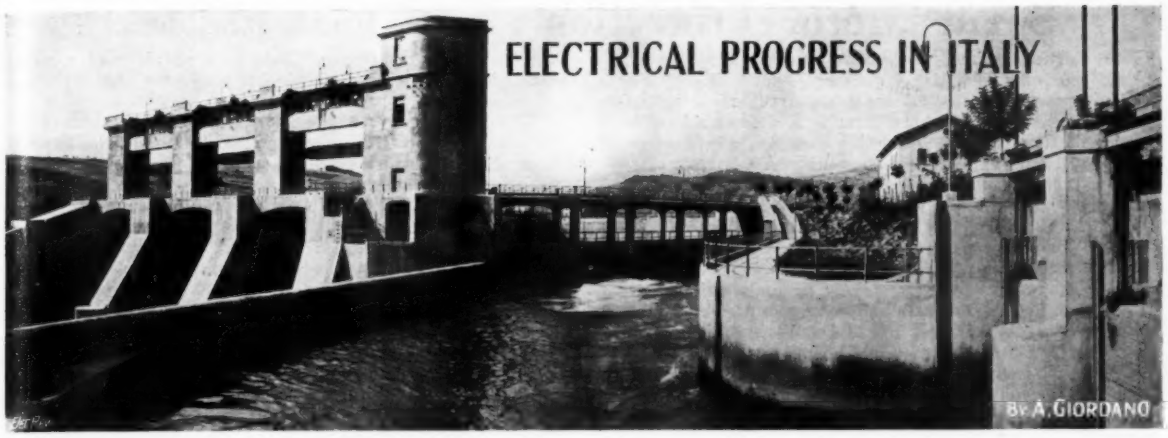
An oil-immersed remote-controlled h.p. selector switch (illustrated) was exhibited by Messrs. Schall & Son, Ltd. This unit is suitable for any style of mounting and has been designed to meet the requirements of shockproof equipments serving up to four different tubes. Indicating labels and lights near the push buttons show which tube is connected, provision being made for electrical interlock, so that only one tube can be in circuit at a time. Hand operation is possible in the event of failure of the control gear and the oil tank can be easily lowered, exposing all working parts for repair. A cannon type therapy tube holder was also displayed.

A range of apparatus incorporating its standard shockproof unit was shown by the Solus Electrical Co. Radiographic outputs are variable between 22 to 35 mA at pressures from 41 to 88 kV peak with screening at 4 mA at from 50 to 93 kV. A simple control unit is provided, and a new timer, governed by the charging period of the condenser, is available. The Victor X-Ray Corporation's impulse timer is operated by a synchronous motor and is a high-grade production which will control exposures varying from 0.01 sec. up to 0.25 sec. The necessary contacting gear is included in the mechanism, and, as this is stated to make and break circuit at zero, contact wear should be negligible. This is the only timing device known to me which will energise a high output set for just one impulse (half-cycle).

Messrs. A. E. Dean & Co., in collaboration with the Marconi organisation, have produced the " Marconi-Dean " short-wave valve diathermy apparatus (illustrated) which is suitable for both surgical and medical work, and generates a continuous unmodulated wave over a range of frequencies variable from 2.3×10^6 to 3.3×10^6 cycles per second. The maximum output at the patient's terminals is stated to be 240 W. Messrs. Stanley Cox have now fitted to their " Intertherm " diathermy apparatus a Bristow faradic coil and a transformer, which additions permit the giving of combined diathermy and faradism, or sinusoidal treatments. Messrs. F. R. Butt & Co.'s latest innovation consists of a motor-driven compensated time switch which, it is claimed, automatically adjusts the exposure time so as to compensate for variations in the supply voltage.

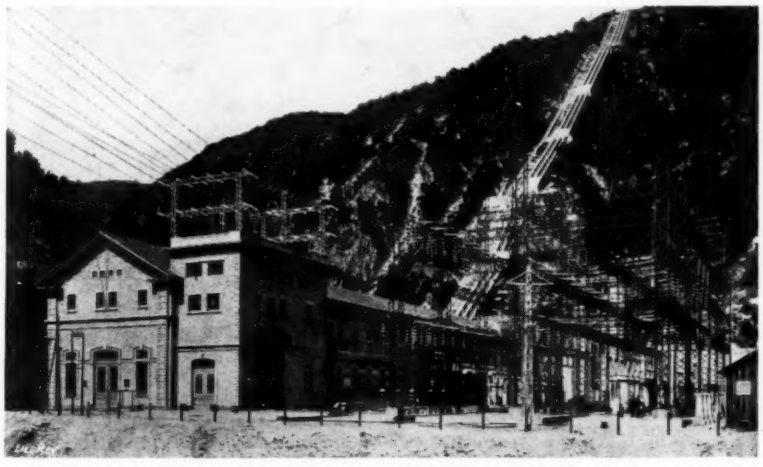
Three interesting pieces of apparatus which have been developed and manufactured in Australia by Mr. J. T. Caldwell, an X-ray engineer, were exhibited by Mr. Cuthbert Andrews in association with Mr. Arnold Baker, also an Australian. The " Quadral " transformer machine provides full-wave valve rectification and is rated to deliver 300 mA at 110 kV peak. It embodies a new " split core " transformer. A patented " gravity " time switch forms an integral part of the " Quadral " transformer control table and accurate timing from one-twentieth of a second to one second in steps of one-twentieth is obtained. The Caldwell portable X-ray unit also attracted considerable notice on account of its small size and weight. The rating is 30 mA at 84 kV.

I consider that this year's exhibition has shown that there is no scarcity of ideas, and much enthusiasm has been displayed on all sides. If progress continues at the present rate British radiology should be well served.



THE reconstruction of the Societá Idroelettrica Piemonte at Turin, which controls the majority of the concerns producing and distributing electricity in Piedmont, has attracted public attention to the position and prospects of the Italian electrical industry, which at the end of 1932 represented a capital investment of 11,795 million lire. The generating capacity rose from 1,860,000 kW in 1922 to 5,292,000 kW in 1932.

Over 80 per cent. of the 5,292,000 kW of generating plant is installed in hydro-electric stations. According to estimates which have just been made by the Royal Italian Hydro-



The Timpagrande station, Southern Italy

graphical Service the average hydro-electric power available reaches about eight million kW. The proportion which it would be technically and economically advantageous to exploit is about five million kW, corresponding to an installed power of about nine million kW and to a yearly output of 30,000 million kWh.

The steam stations in Italy have been generally used as emergency plants, but during the past few years several such stations have been built in which the cost of production is comparable with that of hydraulic power; among these are the stations at Genoa, Leghorn, Naples, Piacenza, Turbigo and Marghera, with an aggregate capacity of 235,000 kW, which could easily be increased to 680,000 kW. A further 615,000 kW is installed in other steam stations serving small districts or single industrial factories. The output increased from 4,550 million kWh in 1920 (150 millions from steam) to 10,970 million (320 million from steam) in 1930. It decreased to 10,012 millions last year (292 million from steam), but from January to August, 1933, the output was 7,108 million kWh compared with 6,494 million kWh for the corresponding period of 1932.

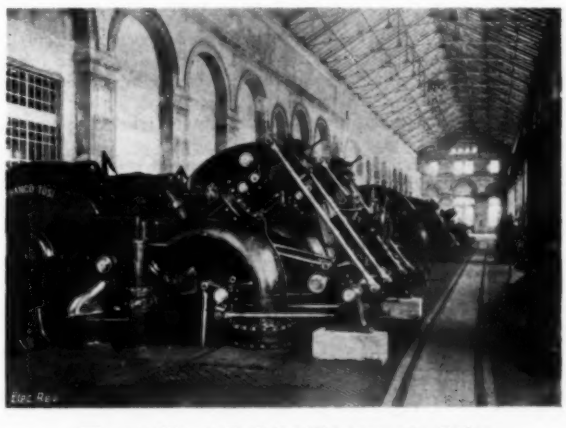
Water-power Problems

The hydro-electric systems are faced with several important problems, owing to high costs of construction compared with those employing solid or liquid fuel, the operating costs of which are decreasing. At present only about 33 per cent. of the power required in Italy is obtained from electrical plants. Efforts to solve the problem have been made by connecting through long transmission lines, hydro-electric centres having different characteristics and hydrological conditions, by supplementing the hydro systems with steam stations, and particularly by connecting the works in the Alps, where there is an abundance of water during the summer and a scarcity during the winter, with those in the Apennines, where the contrary prevails, and by increasing the voltage of the interconnectors to 220 kV. At the end of June, 1933, the high-voltage lines in Italy included 6,650 miles at from 50 kV to 90 kV, 11,150 miles at from 20 kV to 49 kV, and 31,000 at less than 20 kV.

In Southern Italy the Societá Meridionale di Elettricitá (Naples) owns the Sila hydro-electric system, including three stations at Orichella (over 26,000 ft. above sea level) with 27,000 h.p., Timpagrande 75,000 h.p., and Calusia 18,000 h.p. These stations, which are the latest built in Italy, have a yearly output of 500 million kWh. This company also has 53,000 kW of hydro plant installed on the Pescara River, north of Naples. The system includes also smaller hydro-electric stations and a 45,000-kW station in Naples, the ultimate capacity of which is to be 100,000 kW.

Recently another effort has been made to reduce the cost of electricity through the amalgamation of the smaller electricity supply concerns. The Societá Adriatica di Elettricitá of Venice has secured the control of all the hydro-electric undertakings on the eastern frontier up to Bologna and Verona, the Societá Generale Elettrica dell'Adamello (of Bergamo) in the north-east of Milan up to the Brennero, the Societá Idroelettrica Piemonte, of Turin, (known as the S.I.P.) in Piedmont, and the Societá Elettrica del Valdarno, of Florence, in Tuscany.

Whereas in 1925 14.8 per cent. of the total output was used for lighting, 10.7 per cent. for traction, 60.1 per cent. for power, and 14.1 per cent. for the chemical and metal industries, at present about 11 per cent. is employed for lighting, 10 per cent. for traction, 48 per cent. for power, and 31 per cent. for the chemical and metal industries, which have grown rapidly during the last few years, especially in Central Italy, where the Terni Co. has built several factories, and in Southern Italy in the district of Crotone, but it is doubtful whether the increase is sufficient to compensate for the decline in the power load. The lighting load also decreased to 752 million kWh in 1932 from 790 million kWh in 1929, and the figures for the first five months of 1933 do not show any substantial improvement. The consumption for traction has decreased to the replacement of tramways in several large Italian towns by buses.



The machine hall of the Timpagrande station

Small Motor Protection. By D. Rudd, B.Sc.(Hons.)

FOR starting squirrel-cage motors by switching direct on to the line only a simple triple-pole switch is necessary. This provides a market for a standard article manufactured on a quantity basis, and a number of designs have been developed, most of which are intended to be attractive in price. Apart from mechanical reliability the only basis of comparison is the effectiveness of the protective devices, and this may be found to vary over wide limits.

The majority of motor burn-outs are avoidable, and when they do occur, can generally be traced either to insensitive or incorrectly adjusted overcurrent releases. The overload capacity of small motors is strictly limited, and a current 25 per cent. in excess of full-load current, if sustained for any length of time, is definitely harmful to the machine. On the other hand, motors thrown direct on to the line pass a starting current usually of the order of six times full-load current for a time, dependent on the nature of the drive. For a drive with considerable stored energy, such as a fan or centrifugal pump, an accelerating period of upwards of a minute may be necessary.

The desiderata of the ideal overcurrent release are briefly as follows: (*a*) It should disconnect the motor taking more than normal full-load current, in one or more phases for a length of time sufficient to overheat the motor windings. (*b*) It should discriminate between sustained overloads and those of a transient nature due to natural peaks in the load. (*c*) It should not operate during normal starting, but should provide protection in the starting period against faults or stalling of the motor. (*d*) Any practical design would be simple, robust, accurate as regards tripping values, and easy to adjust from normal full-load current upwards.

The three types of overcurrent release in general use are fuses, thermal releases, and magnetic releases. Satisfactory overload protection cannot be obtained by fuses, which are generally used only with small motors where a l.v. release is not necessary and low first cost is the main consideration.

The average open-type fuse is designed to blow with a current of the order of 200 per cent. of the normal, in order to prevent excessive oxidation when running at or about full load. Somewhat closer ratings can be obtained with fuses of the cartridge type, but the severity of the starting current almost invariably determines the size of fuse which can be used with any particular motor. On the other hand, the average fuse has adequate rupturing capacity, and the fusible element itself has an inherent inverse time characteristic desirable with motors subject to momentary overloads.

Thermal and Magnetic Releases

The thermal release has a time characteristic similar to that of the fuse, and since it is heated by the load current either directly or indirectly by means of a heating coil, it has also a capacity for integrating, over a period, the heating effect of a small sustained overload or series of overloads. This, it is claimed, tends to establish a relationship between the temperature rise of the thermal element and that of the motor winding. In practice, however, this is often more apparent than real, since the heating, and, in particular, the cooling, characteristics of the two are likely to be widely dissimilar.

Many designs of thermal release, particularly those employing the bi-metallic strip, are too delicate to withstand the rough usage and lack of maintenance encountered in the average industrial situation, and render reliable tripping within the narrow limits between full load and 25 per cent. overload problematical. In many cases the trip setting which can be used is governed by the severity of the starting current and the time required for the motor to accelerate, the result being that little more protection is afforded under running conditions than that given by a well-designed fuse.

The action of the magnetic or solenoid release is normally instantaneous, and some form of time lag is therefore necessary before it can be applied efficiently to the protection of motors. These releases are usually arranged for direct tripping, and can be calibrated accurately to trip from normal full-load current upwards. Most designs allow of a robust construction and give reliable tripping over the full range of calibration.

When applied to motor control gear the limitations of this type of release are those of the time lag, which usually consists of an oil dashpot arranged to give an inverse time characteristic. The combination of release and time lag is more expensive to manufacture than releases of the thermal type, but offers the advantage of an adjustment for time entirely separate from the overload setting. Thus, it is possible to set the release to trip at a value slightly in excess of normal full-load current, the adjustment of the time lag being sufficient to compensate for the current rush at starting, even with a long accelerating period.

In extreme cases it may be necessary to adopt a time lag setting which involves unduly long delays on small overloads, and the later development of the two-rated time lag offers a solution to this difficulty. Lags of this type give sufficient retardation to cover the most severe starting conditions, while allowing normal delays on small overloads, and, provided the h.p. of the motor is correctly proportioned to the load, it should in no case be necessary to set the overload releases at a value in excess of 25 per cent. overload.

Fault Protection

The protection against electrical faults afforded by the starter is limited to those of sufficient magnitude to cause the over-current releases to operate. Small leakage currents can flow without interruption, and for all practical purposes, protection is only given against severe faults between phases, or from phase to earth on an earthed system. On the occurrence of such a fault the starter may be called upon to interrupt a current several hundred times its rated current, imposing a severe strain on all parts of the switch. Failure to clear under these conditions would result in the destruction of the starter, and the avoidance of further damage would depend on the operation of some protective device further back in the system.

Modern supply conditions demand an increased rupturing capacity from all classes of switchgear, yet the present tendency is towards the use of smaller and lighter switches for the control of small motors. It is not suggested that a starter designed for use under average conditions should be capable of dealing with the short-circuit current available in, or near, a large power station or bulk distributing centre; but since these starters are equipped with releases operative under fault conditions, they should be able to withstand the short-circuit currents likely to be met with in the average situation now and in the future.

With some modern designs, particularly those of the contactor type, the rupturing capacity is little more than sufficient to deal with the stalled current of the motors controlled, and a real danger exists when these switches are installed in positions where the short-circuit power available may be upwards of 1,000 kVA. The question of the rupturing capacity of starters is rarely considered when these are installed, and it is only in the most exceptional cases that any attempt is made to estimate the short circuit kVA available, although this simple precaution is obviously desirable.

To ensure maximum protection for the motor the releases should be set to operate at a value as near full load as possible, with just sufficient margin to prevent tripping under normal conditions. With a setting in excess of 25 per cent. overload, little or no protection is given against the most prolific sources of burn-outs—sustained mechanical overload and single-phase running.

While it is usual to calibrate the releases up to values representing 100 or 150 per cent. overload, these higher settings can have no logical application in the protection of the motor against overload, yet they are often used by the casual maintenance man when persistent tripping of the starter should indicate the possibility of trouble with the motor or the drive. The provision of a fixed overload setting at, say, 25 per cent. overload with a time lag giving sufficient adjustment to cover all conditions would be a safer arrangement and one liable to less misuse in the hands of the inexperienced.

Electrical Progress in Italy (*continued from the previous page*)

The Government has just issued a decree granting facilities to favour the consumption of electricity for domestic purposes, and it is also interesting itself in the application of electricity to agriculture and to the railways.

The existing electric railway lines have a length of about 1,370 miles, and it has been decided to electrify an additional 2,450 miles, besides the new electric railways under construction, such as the "direttissima" from Florence to Bologna, on which it is expected to reach a speed varying from eighty to ninety-three miles per hour with the heaviest trains. Work is in hand on 870 miles of the 2,450 miles, the electrification of which is to be completed within the next two or three years.

In addition to this, the successful floating of a loan of 600 million lire by a corporation of banks, under the auspices of the State, has enabled the Government to authorise the preliminary works for the electrification of the Salerno-Reggio Calabria railway and of the Bolzano-Verona line, among others.

When this programme is completed Italy will have about 4,100 miles, or 40 per cent. of the normal-gauge lines, electrified. At present the Italian State Railways take about 360 million kWh yearly, which on the completion of the Government programme is expected to rise to 1,000 million kWh.

The illustration at the head of this article shows a hydro-electric plant on the Pescara River.

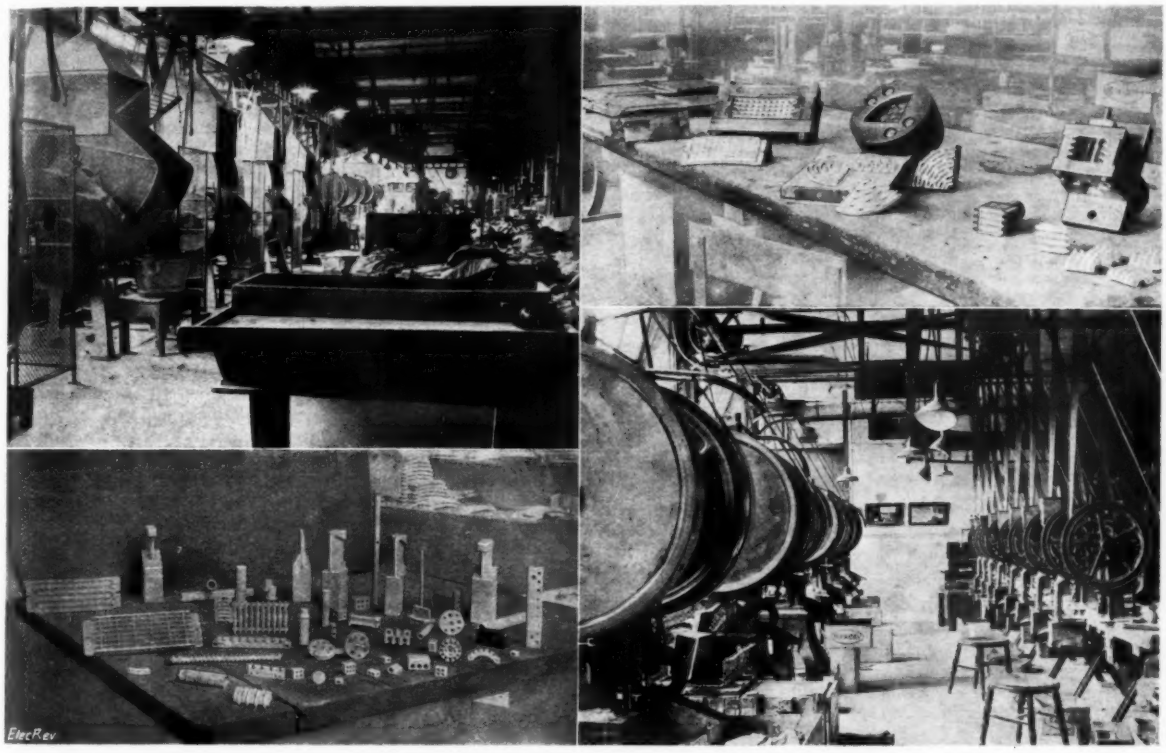
Refractory Production

Engineering methods applied to pottery processes

DURING a recent visit to the works of Messrs. George Bray & Co., Ltd., Leeds, we were particularly interested, indeed fascinated, to see something of how the potter's art can be modified, partly to satisfy the engineering mind, and partly to produce a very wide and varied range of intricate components, including some of the most delicate structures imaginable.

The products include element formers for cookers, fires, and generally all types of domestic and industrial heating appliances, while a large range of tubes varying from diameters of 0.012 in., with 0.004 in holes through their 1¼-in. length, is a fairly long one. After the raw material is produced, it passes to the plant where it is finally pressed. After pressing, the pieces are fired in kilns, the nature of the firing being dependent upon whether the article is to be a refractory material or of a more vitreous nature. After firing all the pieces are examined, and, in the case of articles made to within certain fine tolerances, are inspected and gauged prior to being packed and dispatched.

The company makes refractories and insulators which are sent to practically every country in the world and supplied, it seems to us, to most electrical manufacturers. A large



Plant and Products of a Leeds Refractory Works

1. A part of the clay-mixing machinery. 2. Dies and corresponding mouldings for various types of fire-bars. 3. A selection of medium-size porcelain refractories. 4. Automatic presses for making small insulators

to tubes in the neighbourhood of 4 in. in diameter are made. Some of these tubes are plain, whilst others have threads on them to take exceedingly small gauge wires. These small tubes are of necessity made to very fine limits, as they are to fit into small machined units, where fine gauging is essential. Including very small parts and very large articles, some three quarters of a million pieces of insulation and refractory are made daily.

The material used in the manufacture of insulators and refractories varies considerably in consonance with its application. Large quantities of clays and other materials are mixed in proportions according to the nature of the article to be made, or to the method of the production of the article. This process number of small insulators are made automatically in high-speed presses, and to see small pieces coming out of these machines at a steady and rapid rate was a matter for wonder. The number of standard, catalogued or listed articles made approaches 900, but altogether the company produces well over 3,000 designs.

All the tools which are used in the manufacture of these various insulators and refractories are made in the tool room, and the very highest grade tool steel has to be used in order that the fine limits can be worked to, and the wearing of tools eliminated or reduced to a minimum.

The processes are many and varied; some views of the factory and its products are reproduced herewith.

Electricity Supply in Madras

THE administration report of the Government of Madras Electricity Department for 1932-33 relates to the first year's work since its inception on April 1st, 1932. Mr. H. G. Howard, chief engineer for electricity, states that the 23,430-kVA Pykara hydro-electric station was completed; the revised estimate of the total expenditure is Rs. 1,20,56,100. The h.v. transmission system (ultimately 316 route miles from 11 kV to 110 kV) as originally planned was also put into commission; commercial supply of electricity started in the Coimbatore district and the Nilgiris in October last year, and other towns were subsequently connected. It is anticipated that the financial results estimated for the tenth year will be reached in the sixth year, in spite of a lower average revenue per kWh than that allowed for. The report on the Periyar hydro-electric scheme has been prepared, and, in view of the low interest rates available and growing unemployment, it is urged that a new project should be started as soon as possible. Surveys for 400 miles of h.v. transmission lines were also completed.

The maximum demand on Pykara was 1,000 kW, but a considerable increase was expected this year owing to contracts made during 1932 for large industrial loads, including cement works, tea estates, cotton mills, and bulk supplies. Oil engines taken from the mills have been re-erected in outlying areas to enable loads to be built up pending extensions of the transmission system. Under a hire-purchase scheme, facilities are granted for the electrification of factories and mills; this was taken advantage of last year to the extent of Rs. 1,80,000.

Thirty-two towns in the Presidency now have supplies. The total generating capacity of electricity supply undertakings other than the Pykara plant is 46,200 kW, including the Madras Electric Supply Corporation with 21,500 kW. The programme for 1933-34 includes the construction of over 200 miles of transmission lines and several distribution systems and the completion of generating stations at Virudunagar and Dindigul. A report on the Mettur hydro-electric project is expected to be ready before the end of the current year.

Constant-tension Construction for Overhead Lines

Lower poles and increased spans made possible

THE essential constructional features of overhead lines built on the principle of constant mechanical tension were described in an article by Messrs. E. A. Boyd and C. Bollam in the ELECTRICAL REVIEW of June 20th, 1930, and the advantages of the method were pointed out. As the conductors are anchored to terminal poles in the usual way, carried by pulleys on intermediate poles, and loaded by counterweights at the tensioning points, there can be no mechanical out-of-balance between adjacent spans. The sag is constant at all temperatures, but increased with ice loading, and there is a substantial saving in the height of support required to maintain a prescribed minimum clearance between conductors and ground. These advantages are further discussed by E. Mathieu in recent issues of *Revue Générale de l'Electricité*, where, also, examples are given of the resultant reduction in costs.

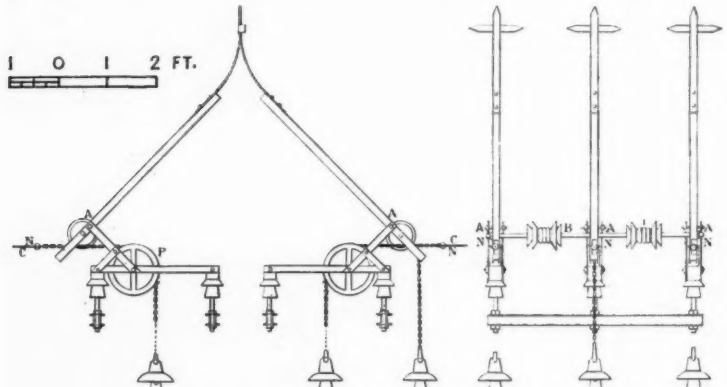


Fig. 1

An arrangement of counterweights and a method of interconnection between conductors providing for automatic isolation in the event of conductor breakage, are illustrated by fig. 1 from the French article cited. Two adjoining sections of the line are electrically connected by bars pivoted at A and capable of describing an arc of a circle. A hole in the lower part of each of these bars provides for the passage of the conductor and counterweight chain, but they will not pass the button or stop N, which is fixed securely to the conductor. When a conductor breaks, it is disconnected by the action of the counterweight and the stop N in tripping the interconnecting bar. This occurs at both ends of the section concerned and on all three phases, the switch bars being connected mechanically, but insulated electrically, by rods B and insulators I. An insulated chain Ch enables the switch bars to be operated manually. The length of each section of the line may vary from three to twelve miles, according to the travel of the counterweight and the type and size of the conductors.

Substantial Economy

The mechanical tension being constant, the conductors may be strung with a tension t equal to the maximum tension T corresponding to the factor of safety imposed; whereas in lines with fixed attachments the ratio $a=T/t$ is about 2.7 for a 4.1-mm. (0.161-in.) copper conductor, about 7.0 for a 6-mm. (0.236-in.), seven-strand aluminium conductor, and about 7.4 for a 4.5-mm. (0.177-in.) seven-strand steel-cored aluminium conductor. These figures express the ratio of the sags (for equal span) in the ordinary method of erection and in the constant-tension method. With supports of the same height in both cases the permissible span is $\sqrt{a}$ times as great in the constant tension system; and $\sqrt{a}=1.64$ for the 0.161-in. copper, 2.65 for the 0.236-in. aluminium, and 2.72 for the 0.177-in. steel-aluminium conductor. In other words, these numbers represent the ratios between the lengths of lines that can be carried by a given number of poles or towers of the same height, and they indicate a substantial economy in favour of the constant-tension system.

If the conductors of a three-phase line are mounted in the ordinary way at the apices of an equilateral triangle with one side vertical, a prohibitive spacing of the wires is required to exclude any possibility of contact between them when swaying irregularly. With the constant-tension mounting, however, the trajectories of the wires are horizontal, contact between them is impossible, and a much smaller spacing is permissible. This adds to the saving already effected on the height of pole for given span, or increased span for given height.

A normal three-phase, 60-kV line recently built in the departments of Calvados and l'Orne comprises three copper conductors of 0.372 in. diameter, and 0.082 sq. in. section, weighing 0.335 lb. per ft., breaking load 4,322 lb.; the conductors are at the apices of an equilateral triangle of 9 ft. 10 in. side, with a span of 656 ft., and poles 52 ft. 6 in. in height above ground (fig. 2). The maximum tension, with a factor of safety of 3, and a wind pressure of 14¾ lb. per sq. ft., is 17,590 lb. per sq. in.; maximum sag 21 ft. 11½ in. These data may be compared with those for constant-tension erection as follows:—

Typical Examples

Case (1)—Span 656 ft.; lower posts: The distance between conductors may be reduced to 4 ft. 11 in. without fear of accidental contact, the trajectories T, fig, 3, being horizontal (*cf.* fig. 2, in which there is a possibility of contact at C). The erection sag is 12 ft. 6 in., and the height of post required is 38 ft. 1½ in., instead of 52 ft. 6 in., as above. Under wind pressure the sag becomes 21 ft. 2 in., and the length of conductor to be paid out, by the rise of the counterweights, is about 1 ft. 2¼ in. per 656 ft. span. If the travel of the counterweights is about 12 ft. each, automatic tensioning devices are required every twenty spans.

Case (2)—52½ ft. posts; span increased: The permissible sag is now about 26 ft. 10¼ in. (fig. 4), and the span about 960 ft. instead of 656 ft.

The saving which results from the lower posts for given span, or greater span for given height of post, is relatively greater the smaller the diameter of the conductors, and is greater for steel-cored aluminium than for copper. The proportional increase in span for given height of support, where the constant mechanical tension system is employed, averages 7½ per cent. for copper conductors from 0.118 to 0.236 in. diameter; 97.2 per cent. for aluminium conductors from 0.236 to 0.472 in. diameter; and 107.7 per cent. for steel-cored aluminium conductors from 0.177 to 0.421 in. diameter. These figures are a measure of the saving in the cost of line erection, but they take no account of the saving resulting from the smaller permissible spacing of the conductors themselves.

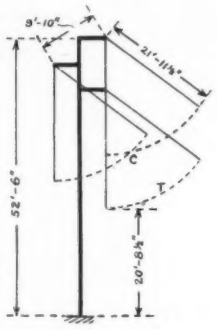


Fig. 2

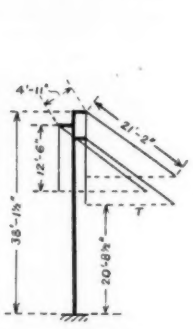


Fig. 3

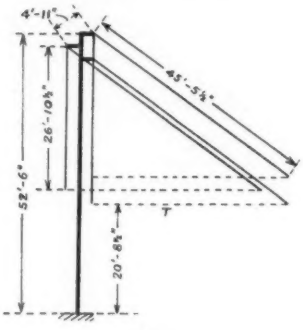


Fig. 4

The theoretical length of sections, or distance between counterweights, increases rapidly with the diameter of the conductors and decreases as the individual spans increase. The practical limit to the length of sections is imposed by the increase in length of conductors due to thermal expansion. There is no dynamic stressing of the conductors due to the descent of the counterweights, however rapidly the wind pressure decreases, for the velocity of descent of the counterweights decreases progressively to zero. The effect of ice loading in increasing the sag and decreasing the ground clearance might be covered by some relaxation of regulations. Alternatively, a mechanical device may be used to limit the rise of the counterweights; or the conductors may be heated electrically to prevent the formation of ice.

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

New Equipment Described at the Radiological Congress

AMONG the papers read at the Annual Congress of the BRITISH INSTITUTE OF RADIOLOGY on December 7th was one on a new continuously evacuated X-ray tube for deep therapy by Messrs. T. E. Allibone and F. E. Bancroft. After a brief summary of previous attempts by various workers to make demountable continuously evacuated X-ray tubes, including a short account of a tube constructed by themselves to operate from a Tesla coil, capable of generating 500 kV, the authors gave a detailed account of a demountable tube specifically designed for X-ray treatment in hospitals.

The tube described, which is similar to that which has been in use for some time at the Sheffield Radium Centre, is continuously evacuated by a pumping system permanently associated with it, comprising an oil diffusion pump having an operating speed of 20 litres per second, backed by a diffusion pump of slower speed, but capable of operating against a higher backing pressure, which in turn is backed by a rotary pump of the usual type. These pumps travel with the tube and are completely automatic. The body of the tube consists of a drawn-steel cylinder about 5 ft. 6 in. long and 8 in. internal diameter, supported by a steel plate attached to a lifting mechanism and counterweight system. Steel flanges, ground and lapped to a high degree of flatness, are secured to each end of the tube. One of these flanges carries a porcelain insulating sleeve and the other carries the anticathode assembly. The end surfaces of the porcelain sleeve and the anticathode assembly are ground to a high degree of precision, and the joints are made vacuum tight.

The anticathode consists of a disc of gold about 1 mm. thick held in a massive copper block set in a copper tube. An arrangement of optically flat flanges permits the anticathode to be rotated within the evacuated tube, so that the normal X-ray beam may be pointed in any direction on a plane, perpendicular to the axis of the tube. Efficient water cooling is provided.

The porcelain insulating sleeve already referred to provides the main insulation and carries at the end remote from the body of the tube the cathode assembly, which is attached by means of flat flanges. The tube being designed for operation at 250 kV d.c. to earth, the porcelain sleeve is about 25 in. in length. The cathode comprises a steel plate closing the end of the porcelain insulator and carrying a tapered steel tube extending along the axis of the tube. The tungsten filament is situated in this tube at the end nearest the anticathode. The X-ray beam, originating from a focal spot rather less than 1 cm. in. diameter, passes through the wall of the steel body, the thickness of which is reduced to 1 mm. over the region involved. Except in the neighbourhood of the thinner wall which constitutes the window, the tube is covered with lead sheet 4-5 mm. thick, which affords adequate protection against stray radiation.

The output of the tube, operated at its maximum current of 10 mA and at 200 kV is such that at 40 cm. distance from the focus the X-ray intensity in free air is about 60 röntgens per minute, after filtration through ½ mm. of iron, ½ mm. of copper, and 1 mm. of aluminium.

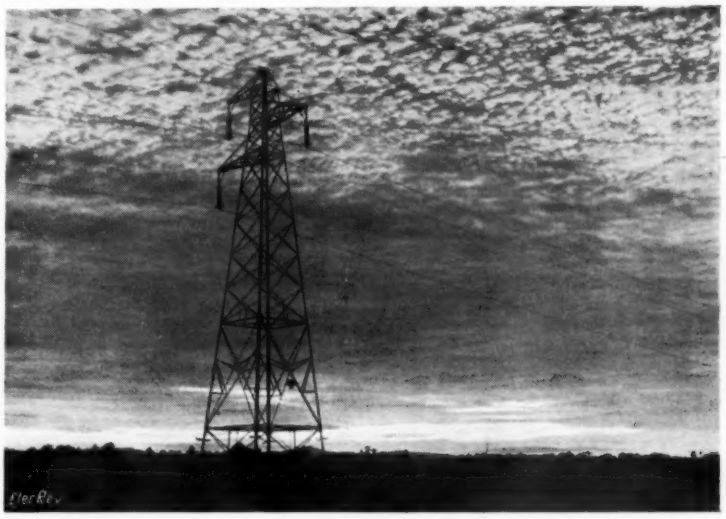
Direct Current at 300 kV

A 300-kV d.c. generator using continuously evacuated rectifiers was described by Messrs. T. E. Allibone, A. Butlestone and G. S. Innes. This has been developed for use with the new type of continuously evacuated X-ray tube at the Sheffield Radium Centre. The generator, which is of the Greinacher type and designed for operation with one pole permanently earthed, makes use of a transformer having one pole insulated for 300 kV (peak) a.c. to earth and the other pole insulated for 150 kV to earth.

The generator having one pole earthed, the transformer supplying filament heating current to one of the rectifiers must be capable of withstanding 300 kV. By a suitable construction it was found possible to obtain the necessary insulation in a single stage. The rectifiers are of a demountable, continuously evacuated type and the associated circuit is such that one of them has its filament at earth potential. For convenience in assembly the two rectifiers are mounted vertically one above the other.

The insulating envelope of each rectifier consists of a high-grade electrical porcelain cylinder, 30 in. in length and 8 in. in internal diameter. The valves are built on a base-plate of steel, machined and ground to an optically flat surface so as to make good contact with a similar flat surface on a porcelain tube of the lower rectifier. The top of the lower rectifier is closed by a steel plate supporting the anode of that valve and the cathode of the upper valve. Similarly the top of the upper rectifier is closed by a steel plate carrying the anode.

In order to make the equipment suitable for use by inexperienced operators, a system of automatic control has been adopted. A suitable press-button starts the rotary oil pump which evacuates a pipe-line containing an electric vacuum gauge. When the air pressure has fallen to the correct value, this gauge operates a relay which opens a vacuum tap and enables the rotary pump to start exhausting the rectifiers. When the air pressure in the rectifiers has reached a preset value, a second vacuum gauge operates a relay and switches on the electrical heating of the diffusion pumps. A water relay connected in the cooling water supply to the pumps provides against accidental failure of the water supply. After the diffusion pumps have been operated for ten minutes the air pressure in the rectifiers will have reached its equilibrium value, and the filaments are automatically switched on so that the valves are ready for use.



If it is not beautiful, this transmission line tower, near Penrith, Cumberland, helps to make a very imposing picture

The main controls of the transformer are also interlocked with the filament supplies for the rectifiers in such a way that the high-voltage cannot be applied until the valves and the X-ray tube are correctly evacuated and their filaments are alight. A miniature indicator gives a warning if any unit fails to operate.

A 400/600-kV Generator

Mr. G. C. Osment described a new high-voltage system for 400 kV and upwards. The high-voltage generator which has been developed with the object of making an apparatus of convenient size for hospital use employs a circuit which is essentially a modification of one previously described by Schenkel, and not dissimilar from that used by Cockroft and Walton in their work on atomic disintegration.

The source of h.p. current is a transformer of the type having its secondary winding earthed at the one pole, and the output voltage is increased by using a cascade arrangement of rectifiers and condensers. In the generator described the voltage on one pole of the output oscillates between three and five times that of the transformer, and the other pole oscillates between five and seven times that of the transformer, but the author pointed out that the output voltage could easily be increased further by the use of additional rectifiers and condensers.

A new type of rectifying valve, having a small voltage drop, and capable of passing heavy currents, contains mercury vapour and is constructed on the same lines as a hot cathode thyratron; it has a low consumption impregnated filament. The power required to heat the filament is only 7 W, as compared with about 100 W for valves of the usual type and the

drop across the rectifier, which is nearly independent of the current, is only about 40 V.

In order to make the rectifier capable of withstanding high inverse voltages (120 kV per valve) each valve comprises several low voltage units assembled in series and the electrical stresses are equalised by small condensers built integrally with the valve. Each filament is heated by means of a small generator, operated by a suitable motor through an insulated drive.

The complete generator, giving an overall output at 600 kV, occupies a floor space only about 8 ft. by 3 ft., and the height is about 8 ft.

Automatic Voltage Regulation

DURING the discussion at the INSTITUTION OF ELECTRICAL ENGINEERS on December 7th on "The Application of Automatic Voltage and Switch Control to Electrical Distribution Systems," read by Messrs. W. Kidd and J. L. Carr, and reported in our last issue, Mr. H. A. Ratcliff said he believed there was neither necessity nor justification for any extension of the existing permissible limits of ±4 per cent. in voltage variation. Most electrical apparatus varied in its effectiveness with the second, third, or even fourth power of the voltage, and to attempt to overcome regulation difficulties in such a way would be a retrograde step.

Mr. E. T. Norris expressed the opinion that the next best thing to installing a regulator at each house—which was impracticable at the moment—was to install them at distribution stations; distribution regulators were now available for connecting to existing transformers economically. He agreed that fully automatic regulation was essential for any distribution system. Automatic regulating gear was now simpler in design, but retained all the advantages and facilities of the more complicated older types. Mr. J. H. Gill suggested that the effect on revenue of maintaining normal voltage all the time might be as much as 10 per cent. where the heating and cooking load predominated; he assumed that the figure of one per cent. applied to a system where the power load predominated. He had no doubt that the step-by-step regulator was not only the cheapest but also the most effective one, provided the voltage step was kept reasonably within 1.5 per cent. The resistor type of gear had certain advantages in that the contact wear was small and the voltage did not fluctuate beyond the difference in voltage between the two adjacent tappings. The reactor type of equipment would be especially suitable if the number of steps or the total range was very large.

Mr. E. S. McWhirter asked if the authors could give estimates of the time saved in failure of supply and in reinstating the supply by means of supervisory control, as the speed of reinstatement had an important influence on revenue. On some systems the cost of the supervisory system had been repaid in three years. In other cases something like 50 per cent. of the cost was saved by the modifications made possible in the switchgear.

More Sub-stations Preferred

Mr. W. A. Crocker stated that at West Ham the large number of cookers installed necessitated higher voltage on Sunday mornings than on week-days. In his view the money could be more usefully spent on additional sub-stations to meet voltage drop than on the installation of tap-changing gear. Mr. F. la T. Budgett referred to a large system on which all secondary feeders were equipped with induction regulators of 10 per cent. positive or negative boost. Compensation gave flat voltage at a suitable point and a chart showed the maximum and minimum distances from the main sub-station at which the distribution transformers could be placed to keep the voltage at consumers' terminals within the desired limits. The series capacitor was another automatic regulating device; a bank in series with each conductor of a three-phase circuit would have its capacity proportioned so that the leading voltage drop through them equalled the reactive drop of the line. This left only the resistance drop, as in a d.c. circuit, and the compensation varied automatically with the load. In one case where this equipment had been applied on a high-voltage circuit about eighteen miles long, feeding three distribution sub-stations, it was found that a single set of series capacitors at the main sub-station provided better regulation than any other method, except a set of induction regulators at each of the three distribution sub-stations, and cost about 40 per cent. less.

Mr. R. M. Charley said that a recording voltmeter showed that the variation of voltage at his house was as much as 16 per cent. A comparison between the cost of a transformer and of a regulator was fundamentally unsound; the comparison should be between the cost of the regulator and that of the line.

Mr. Carr Replies

Mr. Carr, replying to the discussion, agreed that to widen the existing limits of voltage regulation would be a retrograde step. By regulating at distribution sub-stations there was, in effect, no improvement in the current-carrying capacity of the feeders, whereas by regulating at a central point the capacity of the feeders was increased. Voltage regulation in residential areas in Manchester increased the output per distribution sub-station in some cases by nearly 10 per cent., the average being about 5 per cent.

The conditions on industrial networks were too variable to permit of any comparison being made. The time saved by the use of full supervisory control, in the event of breakdown, was likely to be from twenty minutes to half an hour. The cost per kVA controlled by the supervisory system varied widely; the cost of the supervisory equipment—exclusive of the additional cost for closing equipment for circuit-breakers—at Manchester was about £1,200 on a 33-kV sub-station having a capacity of approximately 20,000 kVA.

In Manchester the load density varied from 1,500 kW per square mile on the Corporation housing estates to 3,500 kW per square mile in ordinary residential areas, and about 6,000 to 8,000 kW per square mile in the city area. The inclusive cost of regulation with the system adopted at Manchester was about £1,980 per annum.

The Case for the Alkaline Accumulator

AT a meeting of the London Branch of the ASSOCIATION OF MINING ELECTRICAL ENGINEERS, on December 5th, a paper on "Alkaline Accumulators, with special reference to the Nickel-Cadmium Type," was presented by Messrs. D. W. T. Kirkman and F. Watson Mann. Specific applications of this type of battery mentioned by the authors include lighting and engine starting for heavy commercial road vehicles, lighting and radio operation on aeroplanes, railway train lighting and signalling, for propelling trucks and miniature locomotives, and miners' lamps, as well as general uses. As the cells are made of steel throughout, all parts can be produced with greater precision. Strength and durability are thus increased, resulting in less damage by overcharging, heavy discharging, or idleness.

The discussion was opened by the branch president (Mr. J. F. H. Colyer), who commented upon the very low maintenance costs of the nickel-cadmium battery.

Mr. Webb Ware (A. Reyrolle & Co., Ltd.) asked how one could determine when a nickel-iron battery was fully charged, and how to get a true idea of the state of charge at any moment without having to keep a precise record of the amount of use, and whether there was any definite law relating to the amount of distilled water that was dissipated. He also asked if the authors could give recommendations for conditions under which a trickle charged battery used as a stand-by should be maintained.

Mr. J. A. B. Horsley said the authors were in error in suggesting that legislation would not permit the use of battery locomotives in mines. A few storage battery locomotives were in use in this country; the deterrent was apparently lack of interest or the unsuitability of the mining conditions to haulage by that method. When batteries were used for underground signalling circuits it was necessary, where fire damp was a hazard, not only to use bells fitted with a device to absorb the energy stored electro-magnetically in the winding, but also to limit the current in the circuit. Mr. G. M. Harvey mentioned a recent occasion on which he had opened up one the latest type lamps to examine the plates and had found that in some cases the little cells had bulged to such an extent that one edge had actually parted from the neighbouring cell or from the frame. Was this due to charging at too high a rate? Mr. Bresquar asked how the "Nife" battery lamp compared with the ordinary oil lamp in respect of weight. Mr. Colyer sought information as to the cost of this type of battery, as compared with the ordinary type.

Mr. Gibbs mentioned that in his experience alkaline batteries had proved very reliable for tripping purposes. The cost of installing lead cells for this purpose was prohibitive and one had to consider also the charging periods. Mr. C. T. Payn said that for driving a powerful electric locomotive to which was attached a battery tender a lead acid battery had been installed in the past because it gave a rate of discharge which had not been possible with the nickel-iron battery. The plates of a large lead acid battery could be replaced without the necessity for replacing the whole battery, which had an appreciable effect upon the relative costs.

Mr. D. W. T. Kirkman pointed out that an alkaline battery could not be damaged by overcharging, so that it was not vitally important to know when it was fully charged. A method which had been adopted in many cases was to subject the battery to a big discharge for a very short time and note how the voltage fell. With regard to the loss of water on

charging mentioned in Mr. Webb Ware's remarks he said that the figure of one-third c.c. per ampere-hour put into the battery —as given by Mr. Ware—was approximately correct, but that only applied when the battery was in the fully charged condition. Normally the plates in alkaline cells were expected to bulge a little in order to hold the separators rigid, but that bulging was not expected to reach serious dimensions, and it was very seldom that a pocket had come apart completely. One possible cause of it was operation in electrolyte of much too high specific gravity. The only correct method of determining the internal resistance of a cell was to use an a.c. bridge and to have two cells connected to it in order to ensure that there was no current passing between them. The nickel-cadmium cell could be used very satisfactorily for locomotives, and would give operating conditions comparable with those of the lead cell; an advantage of the nickel-cadmium cell was that it was possible to get a very much higher capacity at that high discharge rate. Approximately the same upper temperature limits—of the order of from 120 to 130 deg. F.—applied to nickel-cadmium, nickel-iron and lead-acid battery cells.

Mr. Watson Mann said it was possible for a battery under trickle charge conditions to become fully discharged, depending on operating conditions. The rectifier must be set to maintain the battery in the fully charged condition.

The weight of the old type of nickel-cadmium lamp was approximately 5¼ lb., whereas the weight of the new high candle-power type was from 10 to 10¼ lb. The saving of £70,000 per annum effected in maintenance costs with alkaline cells as compared with lead cells (for train lighting) was based on a capital cost of £250,000 for equipment. Practically all the electricity supply authorities in this country, and a very large number throughout the Empire, had standardised nickel-cadmium batteries for tripping purposes. Comparing 200-Ah lead type and nickel-cadmium batteries, and assuming 100-V installations, the cost of the former type would be approximately £240 and of the latter about £370. The lead type battery would weigh 7,000 lb., and the nickel-cadmium type 1,800 lb., and the space occupied was also reduced.

The Post Office and Power Lines

AT a meeting of the London Technical Group of the ELECTRICAL POWER ENGINEERS' ASSOCIATION held in London on December 5th, a paper on "The Protection of Post Office Communication Circuits from Power Lines" was presented by Messrs. P. B. Frost and F. E. Wallcroft.

In opening the discussion, the chairman (Dr. N. A. Allen) said it appeared that the whole, or almost the whole, of the trouble could be avoided by using underground cables instead of overhead lines. The Post Office was tending in that direction. A great deal of trouble was caused by mercury arc rectifiers, and he feared that it would be greater still in the future. Mr. J. H. C. Brooking said that the Post Office did not always insist upon the fitting of expensive guards, at any rate on 132-kV lines; he had seen some without guards at all. With regard to the insulation which had to be applied where 132-kV lines running into central stations were within 20 ft. of an earthing place, he had heard that the results of the use of rubber were rather unfortunate.

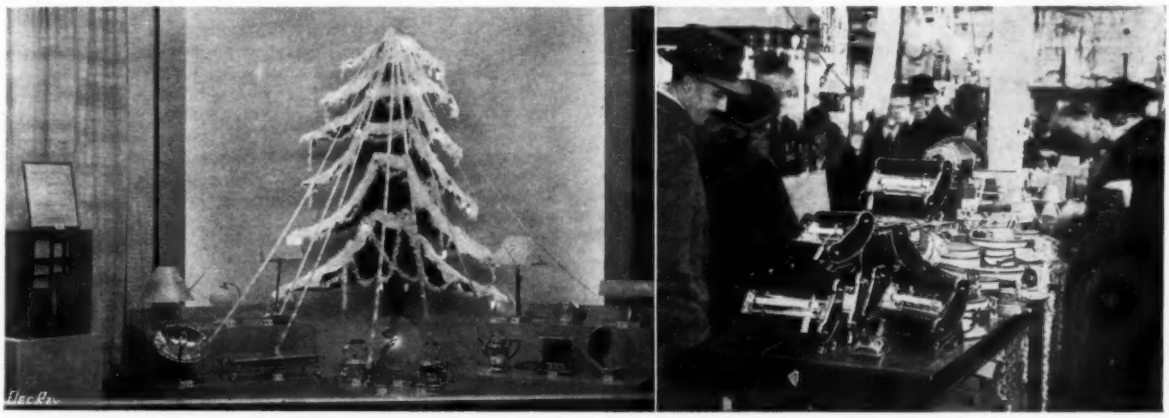
Mr. Wallcroft replied that at 132-kV line crossings the G.P.O. lines were underground; that was why there were no cradle guards. Cradle guards for such crossings would be very cumbersome, and probably ineffective.

Potential Between Neutral and Earth

Mr. A. H. Pennett pointed out that many power engineers had installed their own telephone lines and used them with satisfaction under conditions vastly more severe than those likely to be met by the Post Office. The third and fifth harmonics were particularly troublesome, and he warned engineers against thinking that the neutral of a h.p. or e.h.p. transformer was at earth potential. Pressures as high as 9,000 V to earth on the neutral were possible. A closed delta winding in the transformer would do away with the difficulty. Mr. Frost said he believed that had the Central Electricity Board used a flux density of 12,000 instead of 14,000 the fifth harmonic would have been reduced very greatly. The Post Office was not experiencing much trouble from it. A pressure of 9,000 V to earth on the neutral justified the Swiss regulation which called for lines connecting neutrals to the earth-plate system to be insulated all the way to at least 4,000 V or 5 per cent. of the maximum line voltage.

In reply to Mr. A. G. Hilling, he said that the Post Office had not taken the view that multiple earthing must be prohibited in all circumstances. The grounds for objection to multiple earthing were partly noise interference, partly false signalling and, perhaps most important, the risk of picking up currents on cable sheaths.

Mr. Andrews, dealing with a suggestion that rectifiers should be put on transformers which were 30 deg. out of phase, in order to eliminate the ripple, said that if this were done in one rectifier station with two rectifiers in it, the harmonic would be exchanged between the two; but he asked whether, if it were done in two different sub-stations, there would not be a large amount of harmonic interchange between the sub-stations, giving rise to much interference with telephone wires between the two districts. Mr. Frost said the idea was to have two rectifiers out of phase in each sub-station, though that had very practical limitations.



Electricity supply authorities and most of the London stores are making electrical displays this Christmas. The pictures show the window of the Kensington and Knightsbridge E.L. Co. and a counter at Gamages

Mr. Brent, referring to cradle guards on h.p. line crossings, asked if it were possible to have a semi-independent guard with one end connected to a power circuit support and the other end to two supports on the other side of the road.

Mr. Wallcroft said that the hybrid arrangement of an independent guard and a guard on the power line supports had been used in a number of cases. It had the advantage that where long-span construction was adopted on a power line one could avoid using a long cradle, which was rather cumbersome and was liable to give considerable trouble in snow; a short guard could be used, with independent poles on one side of the road and a power line support on the other.

Mr. P. J. Ridd (G.P.O.) gave an assurance that the Post Office was not placing unnecessary difficulties in the way of power developments; the troubles that it foresaw were real troubles, and unless steps were taken to avoid them the results would lead to a public outcry. Having regard to the high voltages liable to arise, he understood that it was not at all certain that rectifiers in general would prevent acoustic shock; he had been present during an experiment when an induced voltage of 2,400 was placed on a line and rectifiers were placed across the receivers, but although the acoustic shock was certainly reduced, it was still intolerable; further, the rectifier was short-circuited by the voltage and rendered useless. Mr. Wallcroft said that the omission of any reference to copper oxide rectifiers in connection with acoustic shock prevention was intentional, for the authors were aware of the drawbacks of that type of device. Another device which had come to their notice recently was a tube of rare gas connected across the two telephone lines—it was really only another form of lightning or high voltage protector. Experiments were being undertaken to test its efficiency and adequacy.

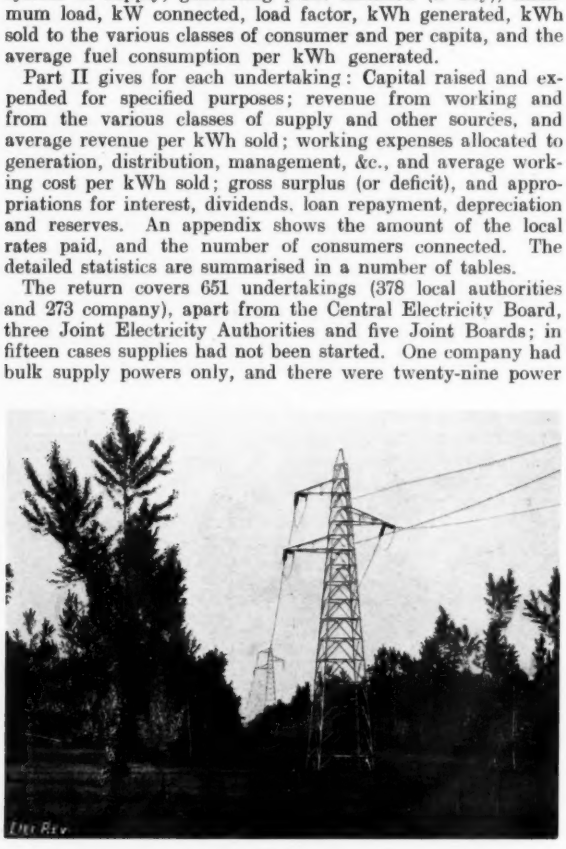
Electricity Supply Data

THE Return of Engineering and Financial Statistics relating to Authorised Undertakings for the year ended March 31st or May 15th, 1932, for public authorities, and December 31st, 1931, for companies, has been issued by the Electricity Commission (Stationery Office, 15s.).

The return follows the general form of previous volumes, and is divided into two parts (I) Engineering, and (II) Financial. Part I gives for each undertaking particulars of the system of supply, generating plant installed (if any), maximum load, kW connected, load factor, kWh generated, kWh sold to the various classes of consumer and per capita, and the average fuel consumption per kWh generated.

Part II gives for each undertaking: Capital raised and expended for specified purposes; revenue from working and from the various classes of supply and other sources, and average revenue per kWh sold; working expenses allocated to generation, distribution, management, &c., and average working cost per kWh sold; gross surplus (or deficit), and appropriations for interest, dividends, loan repayment, depreciation and reserves. An appendix shows the amount of the local rates paid, and the number of consumers connected. The detailed statistics are summarised in a number of tables.

The return covers 651 undertakings (378 local authorities and 273 company), apart from the Central Electricity Board, three Joint Electricity Authorities and five Joint Boards; in fifteen cases supplies had not been started. One company had bulk supply powers only, and there were twenty-nine power



A picturesque part of the 150-kV Pescara-Frattamaggiore line, Naples (See " Electrical Progress in Italy," page 837)

companies (one not supplying). The stage of development attained is indicated by the following averages per head of the 1931 population: Connected load, 320 W; maximum demand, 110 W; sales, 212 kWh.

Of the 9,500 million kWh sold, over 60 per cent. was provided by local authorities. The same proportion applied broadly to generating plant and capital expenditure. About 11,530 million kWh was generated in 464 stations, 95.47 of which was from steam, 0.69 from oil, 3.57 from water, and 0.27 per cent. from gas, waste heat, &c. Of the 7,194,500 kW installed 78 per cent. was in ninety-seven stations with an installed capacity of 25,000 kW or over, and 22 per cent. in the remaining 367 stations, of which 184 had an installed capacity of less than 1,000 kW each.

Of the total generating plant, over 96 per cent. was a.c. of eleven different frequencies. Over 85 per cent. of the a.c. plant was of the standard frequency of 50 cycles per second, the two predominating non-standard frequencies of 25 cycles and 40 cycles per second, accounting for 8.7 per cent. and 4.9 per cent. respectively.

New Generating Plant

A net addition of about 248,700 kW was made to the generation plant capacity during the year, and at the end of 1931-32 over 59 per cent. of the plant installed consisted of steam turbo-alternator units having capacities of 10,000 kW or over. More than 76 per cent. of the aggregate boiler capacity was accounted for by boilers with evaporative duties of 30,000 lb. per hour and upwards. Declared voltages at consumers' terminals for low and medium pressure a.c. and d.c. supplies taken collectively numbered forty-six, including related pairs of voltages on three-wire and four-wire systems. There were nine voltages between 100 and 200 and twenty-one between 200 and 400.

Of the total kWh generated 6 per cent. was used in the stations, and 12.7 per cent. was lost in transmission, distribution, &c. Power supplies accounted for about 57 per cent., lighting and domestic supplies for 32 per cent., and traction supplies for about 9 per cent. of the total kWh sold. The sales of electrical energy for lighting and domestic purposes increased by 327 million kWh, and for power by 64 million kWh, as contrasted with a decrease in the previous year. The number of consumers increased by over 634,000 (nearly 16 per cent.) to 4,646,000.

Intersales of energy in bulk between authorised undertakers for ultimate distribution to consumers accounted for 30.8 per cent. of the total public supply, as compared with 25.8 per cent. in the previous year. The combined maximum load on the public supply undertakings (based on kWh generated and/or purchased) was of the order of 4,926,000 kW, and that on the generating stations 3,951,000 kW. The capacity of the generating plant installed was 2 per cent. in excess of the combined maximum demand upon it. The load factor of the generating stations of public authorities and companies was 31.3 per cent. and 36.9 per cent. respectively, the combined figure being about 33.3 per cent. Coal and coke to the extent of over 8,736,000 tons was burned, including over 1,055,000 tons of pulverised fuel. The average cost of the coal and coke amounted to 15s. 9d. per ton, as compared with 15s. 11d. in 1930-31. (The figures for 1933 are now available in the Commissioners' Fuel Returns, which were reviewed by us on July 7th.)

Financial Returns

The total expenditure charged to capital account amounted at the end of 1931-32 to over £380,000,000 (37 per cent. generation and 63 per cent. transmission, distribution, &c.). The average expenditure for all purposes per kW of generating plant installed was nearly £53. The net capital expenditure during the year amounted to upwards of £26,000,000, an increase of over 7 per cent. on 1930-31. The total revenue from the working of all authorised undertakings (exclusive of intersales) was £58,606,000, representing an average of 1.48d. per kWh sold. The average revenue per £100 of capital expenditure amounted to £15.4.

The total working expenses (including the cost of all energy purchased from outside sources, but excluding interpurchases between authorised undertakings and also capital charges) were over £30,805,000. They absorbed 52.5 per cent. of the corresponding revenue from working (generation accounting for over 36 per cent. of the total). Distribution and management each accounted for about 17 per cent., and local rates for 14 per cent. The average working expenses per £100 of capital amounted to £8.1. The excess of revenue from working over working expenses amounted to £27,801,000, and represented 7.3 per cent. on the capital expenditure at the end of the year. Allowing for revenue from other sources amounting to upwards of £2,588,000, the gross surplus in 1931-32 was £30,390,000, representing nearly 8 per cent. on the total capital expenditure.

The gross surplus was appropriated by public authorities to the extent of 38 per cent. for interest charges on loans and deposits, 47.1 per cent. for repayment of loans and transfers to sinking funds and to reserve and renewals funds, 11.5 per cent. for capital outlay and special expenditure, and 1.9 per cent. in relief of local rates (£335,074 net). The remainder, amounting to over £243,000, represented the increase in the balances on net revenue account. Company undertakings allocated 60.2 per cent. of the gross surplus to interest charges and dividends, and 39.4 per cent. to transfers to depreciation and reserve funds. There was a decrease of over 347,000 in the balances on net revenue account. The average rates of the preference and ordinary dividends calculated on the corresponding capital raised at the end of 1931 were 5.78 per cent. and 7.05 per cent. respectively.

At the end of 1931-32 the capital (or loan) accounts of authorised undertakers were overdrawn to the extent of over £24,000,000; the balances in depreciation, reserve and renewals funds, including sinking funds in the case of public authorities, amounted to upwards of £43,000,000; and the balances on revenue account amounted to £4,827,000. The electricity supply industry gave direct employment to 67,855 staff and workmen (an increase of 3,000 over the previous year), the total salaries and wages charged to revenue account amounting to £10,544,000. Those employed on generation numbered 17,847, on distribution 37,719, and on administration 12,289, the total representing nine persons per 1,000 kW of generating plant installed.

The return takes no account of supplies utilised by railway and tramway authorities and derived from their own generating stations, other private generating stations, or of non-statutory undertakings.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Why the Difference?

The attitude of Mr. Blagborough of Wadhurst regarding the cost of electricity, expressed in the letter published in your issue of November 24th, is more than justified and, strangely enough, Mr. Clifford, who writes on "Electricity on the Farm" in your current issue, has thrown further light on the matter. He says: "The cost of tapping the 11-kV line is from £100 to £150."

Now frankly farmers are in most cases saddled with old debts—600 farmers went bankrupt last year—and when the cost of installation, motors, &c., is piled up they are more than inclined to keep their engines and burn paraffin at 6d. per gallon. I have been on farms where oil lamps are used; they are quite safe, for the straw in cowsheds is too wet to burn and the modern paraffin lamp can be burned for a week for 3d. and give a light equal to electric and quite as clear. I have been very surprised to find these lamps so efficient.

The great thing is to cheapen the cost of the mains and let the Central Electricity Board split the cost over rural and industrial areas, so that the former get a square deal and do not have to pay for a lot of cable at any price that the supply companies and cable makers care to charge for it.

My advice to the farmer is to refuse to have the supply; then the company will come cap in hand and beg to be allowed to put the cable in. I am an electrical man, but I try to be fair in my dealings. J. SCOTT.

Lamberhurst, Kent, *December 9th.*

Current Transformers

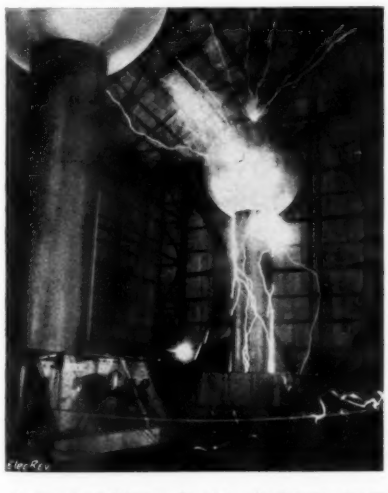
Mr. Robertson has replied to my query by suggesting that the current in the faulty phase of a shell-type transformer or bank of single-phase transformers would be of negligible magnitude. Even so, if it exists at all, it must have some definite composition. What is it?

The discussion on page 116 of Messrs. Wagner & Swan's book is directed to show that, while in shell-type transformers and banks of single-phase units, the impedance to zero sequence currents is the same as that to positive sequence currents, it is not so in the case of the three-phase core-type construction. But that discussion cannot be advanced as evidence that zero sequence currents can flow in the particular case under consideration; as I have already shown, unless the secondary zero sequence flux is wholly suppressed it must fail.

Finchley, N.3, *December 9th.* THOMAS ELLIS.

Electrifying North Wales

I was particularly interested to read the article on this subject in your issue of November 24th and you will appreciate this when I tell you that it was my privilege as resident engineer to carry out the original North Wales scheme in 1904-1906 on behalf of the contractors, Messrs. Bruce Peebles & Co., Ltd. You published details of this scheme in your issues of December 7th and 14th, 1906.



A seven-million-volt d.c discharge from the large electrostatic generator recently installed at the Massachusetts Institute of Technology. The apparatus was designed by Dr. R. J. van de Graaff

My interest at this date is to note particularly that the wooden poles erected twenty-seven years ago are still giving service but from observations I made some few years ago, when travelling down the Llanberis Pass, I noticed that the steel lattice poles erected at the same time had apparently been replaced by wooden ones some years ago. These lattice poles were not treated at all and it would be of interest to know the expected life of the new grid towers.

The carrying out of this scheme and the electrification of the slate quarries, most notably the Oakley Quarries at Festiniog, in those days was beset with difficulties which do not exist to-day.

The pioneers of the scheme should be well rewarded by the knowledge that North Wales has proved to be the original home in Britain of e.h.p. power transmission. W. V. WAITE.

Sheffield, *December 8th.*

The Heating of Lampholders

It was very interesting to read Mr. Long's statement in your issue of November 24th proving that air ventilation in bakelite lampholders proved no solution whatsoever to the problem of overheating. As Mr. Long has, however, only given the resultant effect and has not stressed the causes, I should like to add them. Quite apart from other reasons, one

Mr. O. Quincey, chief electrical engineer at the White City Stadium, inspecting the new electro-magnetic brakes of the one-ton truck which carries the "hare" round the greyhound track

of the difficulties arises from the fact that, because the bakelite in an all-bakelite holder does not sufficiently radiate off the heat, too large a proportion rises upwards to the flex.

This, however, is no new discovery. Of all the various types of bakelite holders which my firm makes, the one type which has no such continuity of bakelite material for transmitting the heat—the original type introduced in 1926 and still largely used—has no ventilating holes and does not require any. R. NETTLE,

Managing Director, Victor H. Iddon, Ltd.

Manchester, *December 5th.*

A Warning to Contractors

I would like to know if your correspondents, Mr. E. W. Devenish and "E.C.3," are members of the National Register. If so I would refer them to the list of registered contractors wherein they will see that the supply companies to which they refer are also members and therefore encouraged to carry out contracting work to the detriment of the legitimate contractor.

When the National Register was started I thought at last something was being done for the protection of the contractor, but I received a shock when I discovered that about fifty supply companies were also members. I began to wonder what the game was, and I am still wondering, as so far I have failed to get an explanation from the National Register. Sooner or later, the contractors' eyes must be opened (the sooner, the better) to the fact that this scheme was not instituted for his benefit, although he pays his subscription.

There are thousands of contractors in this country, and my advice to them (especially the registered ones) is to demand fair play and protection from their associations, for if this state of affairs is allowed to continue they will find themselves driven out of business by the supply companies.

December 5th. REGISTERED CONTRACTOR.

Overhead Road Crossings

The subject of overhead line protection at road crossings is one of considerable interest and importance to all concerned, and there is undoubtedly a real desire on the part of those erecting such lines that every reasonable safeguard should be provided. Much unproductive capital, however, has been, and is being, invested in this country in so-called safety devices designed to cope with any and every possible contingency, absolutely without regard to the reasonable chances of its occurrence, and it is time that such matters were considered from a more practical point of view.

Mr. Jocelyn Swan favours the use of duplicate insulators in

tandem, with a bridle wire set up over their tops, but why is it necessary to use two insulators? The supposed object of any such arrangement is to safeguard users of the road by preventing the falling of the conductor should it fail as a result of a flash-over at the insulator. To be effective, the bridle wire must be kept well clear of the insulators, and be securely clamped to the conductor well away from them on each side. Should the conductor fail within the bridle, there seems little doubt that the binders, subjected to the sudden application of practically full line tension, would break, or the conductor end would pull through them, and the conductor, held together by the bridle wire, would drop on to the cross-arm. Then what useful purpose could the second insulator serve?

Flash-overs at road-side insulators are invariably the result of stone throwing, bird contacts, or lightning. Would it not be much more reasonable and satisfactory from all points of view to dispense with the second insulator and to erect a single insulator, slightly larger than those on the ordinary line pole, together with an adequately secured bridle wire set well over the top, and possibly slightly towards the pole?

The adequate securing of the bridle wire to the conductor is of utmost importance, since the whole arrangement relies for its effectiveness upon the ability of clamps to hold the conductor under conditions of suddenly applied line tension. It is to be feared that many bridles, particularly when not erected under tension, would prove inadequate in this respect, the extra cost of the arrangement in such cases being so much waste of money so far as safety is concerned.

London, W.2, *December 11th.* G. W. PRESTON.

A Grid Phenomenon

Recently as I passed under the 33-kV grid line near Epsom Downs my attention was attracted by a loud humming from the line accompanied by frequent crackles. It was after dark and the atmosphere was very damp. On looking up a corona could be seen plainly around the shed at the line end of the insulator on each phase. The insulators were in tension, the pylon being at the end of a section, and flashes were seen between line and pylon, across the insulators. The flashes were quite bright, and well worth watching.

Considering the number of days each year on which the conditions will be the same, or even worse, it seems to me that after a short time these insulators must fail under the stress, and so give rise to serious troubles. The solution to the problem appears to be either to use more sheds per insulator or to use a different design for insulators at the end of a section. I should like to know if any trouble has arisen previously from this cause and if any steps are contemplated to overcome it. H. W. C. GATEHOUSE.

London, S.W.17, *December 6th.*

Variations in Distribution Voltage

The paper read before the Institution of Electrical Engineers on December 7th by Messrs. Kidd and Carr on "The Application of Automatic Voltage and Switch Control to Electrical Distribution Systems" is most timely as, with the present rapid increase in domestic demand, the problem of maintaining the proper voltage at the consumer's terminals becomes a most important one. Due to this rapid increase, many undertakings have an area in which the voltage variations exceed that permitted by law, and it is incumbent upon the distribution engineers to deal with this problem quickly. It is doubtful whether, with a few exceptions such as Manchester, it has been properly watched and met, and there are few of us who have not experienced voltage variations which are irritating to say the least.

It is to be hoped that E.D.A. will take a close interest in this matter, and impress upon the supply authorities the necessity for supplying consumers within the legal variation permitted on the declared voltage of plus or minus 4 per cent. In places where the density of population is low, more attention might be given to the supply of individual consumers from transformers connected to the h.v. supply. Transformers at present are extremely cheap and reliable, and their frequent use would ensure for the consumer a better voltage at his terminals. I know of one instance where, on a declared voltage of 200, a consumer has had to put in 230-V lamps to meet the large voltage variation caused by a neighbouring works, and there is no indication that the local supply authority has any plans for remedying this situation.

The consumer, in my experience, only complains in extreme cases, but he rarely complains if his voltage is higher than the declared voltage. GERALD B. GILL.

Gerrards Cross, *December 11th.*

A Large Electric Furnace Installation

FOR some time past the construction of an extensive electric furnace installation has been in progress for the new aluminium works at Zwetmetsoloto, in Soviet Russia. The considerable output required from this plant, the large dimensions of the pieces to be treated, and the resulting high power requirements made necessary designs which considerably exceed in dimensions and type of construction anything previously attempted by the makers, the Brown-Boveri Co. For the greater part, the furnaces (twenty-one with a total rating of 4,316 kW) are designed as continuous-progress furnaces with electrically driven conveyors. In the pressing shop, for the 600-ton press, two electrically heated pusher-type furnaces with guide grooves, for warming up cylindrical aluminium blocks with a maximum diameter of 4¾ in. and a length of 8 in., are being installed. The length of the heating chamber of these furnaces is 118 ft., the maximum temperature 720 deg. C., the maximum power consumption 100 kW, to be taken from a 380-V three-phase supply, and the hourly output of one furnace about 6 cwt.

For the 1,500-ton press an electric furnace with a step-type conveyor is being provided for continuous service for preheating round blocks of duralumin and of aluminium alloy 8 in. in diameter and 28 in. in length.

Of special interest are the step-type conveyor and the discharging device, together with their drive. Four fixed and two movable rails run through the heating chamber. All the rails are divided into sections and connected by articulated joints. The rails are recessed to take bars or blooms. The drive imparts a vertical reciprocating motion to the movable rails and at the same time a horizontal one in the direction of the longitudinal axis of the furnace. By a suitable combination of the movements any point on a movable rail can be made to describe approximately an ellipse.

At the exit the movable rails are on the same level as the fixed ones; the blooms therefore rest on all the rails, and when the drive is set in motion the movable rails together with the blooms are lifted and moved forward at the same time by the distance of two recesses in the rails. The movable rails then move downwards and the blooms come to rest in the next recess of the fixed rails. The movable rails now sink still farther and move back under the blooms into their initial position; in this way the blooms are moved forward each time by one recess.

At the end of the heating chamber the last bloom as it moves forward is laid on the rollers of the discharging device. The operations are so arranged that the drive remains at rest until the treatment of the blooms under the press is finished. The output of the furnace amounts to thirty blooms per hour, the length of the heating chamber being 37½ ft. and the maximum power consumption 440 kW. The temperature of the heating chamber is constant throughout the whole length and can be brought up to a maximum of 720 deg. C.

For the 3,000-ton press an electrical continuous-process conveyor chain furnace is also being supplied for preheating round blocks 16½ in. in diameter and 43¾ in. in length. The furnace will have a heating chamber 46 ft. long, a maximum power consumption of 815 kW, and an hourly output of 3 tons.

The hot rolling mill department is being provided with two electric furnaces with step-type conveyors for the continuous preheating to a temperature of 500 deg. C. of blocks, slabs, and plates of duralumin before rolling. The furnace is intended to deal with material measuring 8 by 48 by 60 in. and 1 by 44 by 104 in., its power consumption will be 415 kW, and the hourly production 31½ cwt. In the same department there will also be an electric pusher-type furnace 29½ ft. long for the continuous heating and hardening of aluminium strip up to a maximum of 28 by 24 in., and a hot-air circulation furnace for hardening duralumin sheets or tubes.

In the sheet and tube rolling mill two electric furnaces with conveyor chains are being installed for the continuous annealing of tubes and strips of a maximum length of 26 ft. and of sheets of duralumin of a maximum size of 100 by 44 in. by 0.5 to 0.6 mm. with an annealing chamber 39 ft. long, a furnace temperature of 600 deg. C., an hourly production of 15 cwt., and a power consumption of 300 kW.

In the sheet and tube rolling mill there will also be an electric heating and hardening furnace with an effective heating chamber length of 23 ft. 6 in., a power consumption of 250 kW, and an hourly production of 5 cwt., with an electrically driven step-type conveyor for the continuous hardening of rolled sections, and tubes of aluminium and duralumin with a maximum length of 23 ft. and diameter of 8 in. For the laboratory at the new works eight small furnaces are being provided for working temperatures of from 1,000 to 1,300 deg. C. for the heat treatment of tools, dies, &c.

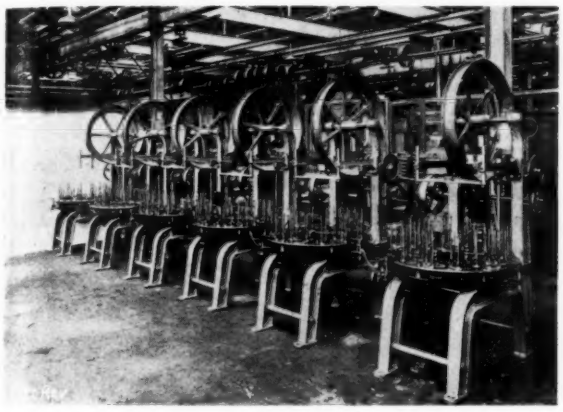
In the melting section will be installed an electrically heated melting furnace for duralumin with a capacity of 20 cwt. and preliminary melting zones at each side, a bath temperature of 700 deg. C., and a power consumption of 150 kW of similar construction to the aluminium melting furnace, but larger.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Cable-braiding Machinery

The SELSON MACHINE TOOL CO., LTD., 23, Abbey House, Victoria Street, S.W.1, is now building, under licence, at Letchworth, a cable-braider of a type which until now has been imported from the United States. A large range of machines is available which vary in the number of carriers from eight to ninety-six, and in the size of bobbins from 3¼ by 1¼ in. to 7½ by 4½ in.; single-, double-, or triple-deck constructions can be supplied. The machines are made to jigs and all parts are accessible and interchangeable. The carriers are of the "Morspeed" type in which the use of spring operation instead of tension weights is claimed to permit of a 60 to 75 per cent. increase in speed. Special carriers for wire braiding can also be fitted.



A cable braider with twenty-four carriers

Light-weight Spun-iron Pipes

The STANTON IRONWORKS CO., LTD., near Nottingham, has added to its range of "Stanton Delavaud" spun-iron pipes a new 3-in. diameter pipe which is ¼ in. in thickness and weighs 1 cwt. per 12-ft. length. Although it conforms to the British Standard Specification, and is tested to 200 lb. per sq. in., the new pipe is not intended to replace the present thicker 3-in. diameter spun-iron pipe. The manufacturers anticipate, however, that it will be adopted by many buyers who prefer cast-iron pipes to those of other materials.

A Novel Lamp Standard

The "Chummy" lamp is the name given by ENSIGN, LTD., 89, High Holborn, London, W.C.1, to a novel table standard which they have just introduced. The greatest asset of this little lamp is its compactness when folded up; in this position it becomes a sphere about four inches in diameter, with an additional two inches on one side for the cord grip and lampholder. In such a position it can be taken about in the smallest attaché case or in the handsome brown cardboard box provided (7½ in. by 4½ in. by 4½ in.). When travelling, the lamp should be invaluable as it can be used on the dressing-table, on the wall, or as a shaving light, and a special spring clip enables it to become a very satisfactory bedlight; the same clip allows the lamp to be clamped on the edge of tables and desks, although the base is weighted sufficiently for it to function efficiently in the form of a table lamp. A 20-W lamp will fit into the standard bayonet lamp holder, and the fitting can be closed without damaging the lamp.

The "Chummy" lamp

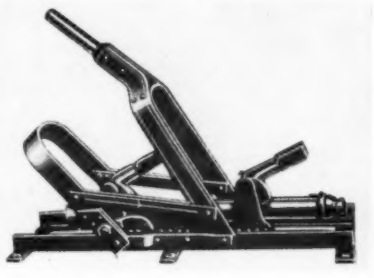
The standard model is finished in oxidised copper and costs 18s. 6d., but a florentine bronze finish can be obtained at the same price, and chromium plate for 23s. Three yards of flex, fitted with a "through" press-button switch and a two-pin plug fitted with bayonet lampholder adaptor, completes the equipment.

Conduit Insulation

"Insuloid" is a recently introduced conduit insulation for the internal connections of electrical instruments that has been placed on the market by the INSULOID MANUFACTURING CO., Ford Street Mill, Chestergate, Stockport. The principal claims made for this conduit are: (1) Electrical properties that do not deteriorate with age; (2) immunity from trouble in damp atmospheres; (3) an unusually high breakdown value; (4) non-hygroscopic qualities which protect the conductors against corrosion; (5) a mechanical strength that permits the use of a smaller wire than would otherwise give the requisite rigidity, thus facilitating neat wiring; (6) an internal smoothness that makes possible the insertion of a closely fitting wire. The conductor can easily be inserted in the tube, after which it can be bent around a small radius.

A Pipe-thrusting Machine

SKYLUX, LTD., 22, Great St. Andrew Street, Shaftesbury Avenue, W.C.2, has notified us of an improved pipe pusher which it is marketing at £12 10s. It is made entirely of steel and will operate in any soil where a spade will dig; it is therefore possible to use it to push metal pipes under railway beds, streets, lawns, hedges, &c. Every part is replaceable, and it can be operated by unskilled labour. The frame length is 40 in., the width 14 in., and the capacity up to 2 in., but an enlarger is available which enables the pusher to be used for laying pipes up to 4 in. in diameter.



The Skylux pipe-pushing apparatus

An Automatic Record Player

The Collaro automatic record player recently introduced by COLLARO, LTD., Culmore Road, Peckham, will convert any radio receiver into a radio-gramophone, and play 9 in., 10 in., and 12 in. records, in any order, without adjustment for different sizes. The lid of the cabinet need not be lifted for record or needle changing, and there are no controls. The record is automatically returned when it is played, and it switches the current "on" when inserted and "off" when playing has finished. The machine is entirely shock-proof. Models can be supplied for all frequencies from 25 to 100, and for voltages from 100 to 260. The universal voltage switch block allows the motor to be switched over instantly from one range to the other. With a duplex plug adaptor inserted in the mains socket, both the radio set and the automatic record player are plugged in separately to the mains. The only other connection is the pick-up to the set. Table and cabinet models are available.

A cabinet Collaro automatic record player with a radio set on top

A Combined Flashlamp and Key Holder

A sample of the "Keelite" has been sent to us by BURGESS PRODUCTS, LTD., Barwell, Leicester. Priced at 3s. 6d. this handy combined torch and key holder has a multitude of uses—for instance, the first things the mains man wants when visiting the transformer or switching station at night are his keys and a light. The "Snaplite" torch (1s. 6d.), another product of the company, is incorporated; the bulb lights up when the top of the case is lifted up, while closing it again immediately switches off the current. The battery (price 9d.) is easily removed, and the bulb (4d.)

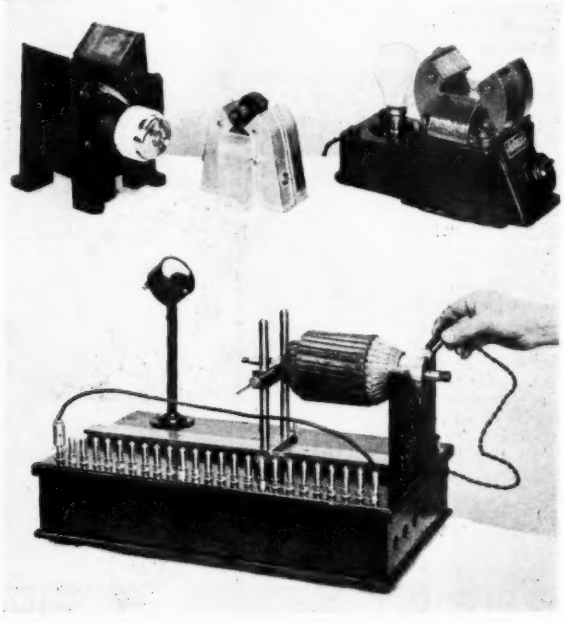
The "Keelite" combined flashlamp and key purse

D

is rated at 2.2 V. Six different shades of leather are available at the same price.

Automobile Electrical Equipment Testing

A new millivolt drop test and three new growlers for testing armatures are being made by the AUTOCAR ELECTRICAL EQUIPMENT CO., LTD., 32, Albert Embankment, S.E.11. The drop test has been designed on practical lines, and it embodies everything that is essential in the testing of an armature



The three new "Autocar" growlers, and the millivolt drop test

without superfluous and expensive fittings; it will test armatures from 1 in. to 1 ft. in diameter.

When testing, the commutator is laid in a "V" block, and the current is fed by direct contact with "V" block segments. The back end support is of rugged construction, machined from the solid in steel, and is easily adjusted in either horizontal or vertical plane. A special feature is the entire elimination of sliding resistance contacts.

The instrument is fitted with a wide range of contact studs, connection being made by a strong brass socket, giving positive connection in every case.

With regard to the growlers, the small model has been specially designed for use upon hair dryers, vacuum cleaners and fractional h.p. armatures, and its capacity is clearly indicated in the accompanying photograph. The medium-size growler is also fitted with test points. The lamp in circuit can be used as a pilot light, thus obviating current wastage by the growler being left switched on.

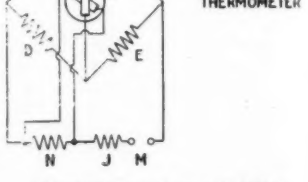
The large growler is essentially for electrical service stations, having two sets of windings and a two-way switch, one for ordinary dynamo or motor armatures, and the other of a much heavier capacity for starter motor armatures.

The three models are priced at £1 15s., £3 17s. 6d., and £4 10s., respectively, and the millivolt drop test costs £8 10s.

Electrical Distance Thermometers

The use of one temperature indicator to ascertain the readings of thermometers in widely separated positions is made practicable by the "Siemens" electrical distance thermometer manufactured by MESSRS. ELLIOTT BROTHERS (LONDON), LTD., Century Works, Lewisham, S.E.13. Readings of the different thermometers are taken by depressing a button in circuit with the appropriate selective switch.

The thermometer consists of a coil of nickel wire for temperatures up to 100 deg. C., or a platinum wire for higher temperatures, and variations in resistance with temperature are measured on a Wheatstone bridge. In the accompanying diagram, coils C, D, and E are wound with wire having a negligible temperature coefficient and are so adjusted that the pointer of the cross-coil indicator K is deflected across the scale (calibrated in degrees) in conformity with the varying resistance of the thermometer coil within a range of from −200 deg. to +500 deg. C.



Connections of an electrical distance thermometer

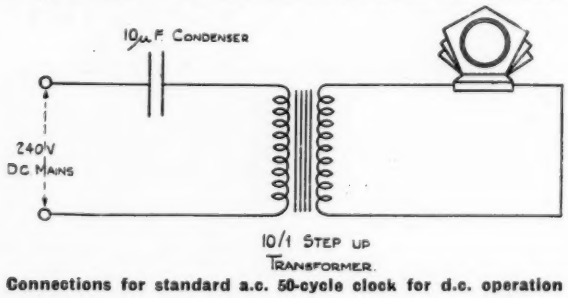
Current may be provided from a battery or from the mains, connected at M; if the supply is a.c. a small rectifier is required. The indicator has two coils set at a fixed angle which move between the poles of a permanent magnet. Current passing through one of the coils controls the deflection of the coil and pointer system. The main coil is connected in the diagonal of the Wheatstone bridge, and the cross-coil is connected across a resistance, N, in the main bridge circuit, and thus carries a proportionate value of the bridge current. Variations in supply voltage up to about 2 per cent. are automatically compensated for by the cross-coil.

Synchronous Clocks on D.C. Mains

WHEN a d.c. supply is obtained from a three-phase time-controlled 50-cycle system converted by means of mercury arc rectifiers, a pronounced third harmonic ripple may occur which is equivalent to the superimposing of a 150-cycle a.c. wave of a magnitude of about 66 V r.m.s.

To such a supply a consumer in Devon connected a standard synchronous electric clock, designed for 230 V 50 cycles, which with two slight modifications in the movement indicated correct time. The first modification was to compensate for the third-harmonic frequency. As the rotor ran originally at 500 r.p.m. (three times the 50-cycle speed), a three-to-one reduction gear was inserted so that the seconds hand should rotate one revolution per minute.

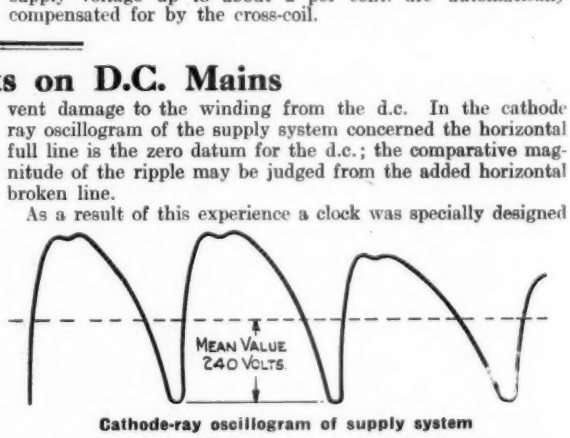
Secondly, as the ripple voltage was only one-fourth that for which the clock was designed and the impedance of the clock



Connections for standard a.c. 50-cycle clock for d.c. operation

coil was approximately trebled when connected to a 150-cycle supply, either the coil would have to be redesigned or 600 V would be required to obtain an adequate working flux for the synchronous motor. It was more convenient to obtain the higher voltage, and a transformer of one-to-ten ratio was installed between the supply and the clock coil. A 10 μF condenser was inserted in the primary of the transformer to prevent damage to the winding from the d.c. In the cathode ray oscillogram of the supply system concerned the horizontal full line is the zero datum for the d.c.; the comparative magnitude of the ripple may be judged from the added horizontal broken line.

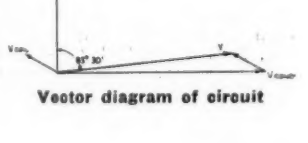
As a result of this experience a clock was specially designed



Cathode-ray oscillogram of supply system

and constructed to operate on the 150-cycle ripple, the clock and condenser constituting a self-contained unit. The connection of the clock to the supply was similar to that illustrated with the exception that the transformer was no longer required. The electrical characteristics of this clock were: Resistance of coil, 6.6 ohms; capacity of condenser, 2.0 μF; current in circuit, 0.16 A; magnitude of 150-cycle ripple, 66 V; voltage across coil, 14.0; voltage across condenser, 77.0; total watts, 1.2; VA of coil, 2.24; VA of coil and condenser, 10.56; torque of synchronous motor, 0.55 gm. cm.; speed, 500 r.p.m.

Mr. Geoffrey Ghey, of the Royal Naval College, Dartmouth, who brought these interesting facts to the notice of Messrs. Ferranti, Ltd., has clocks of this type now operating satisfactorily on his d.c. mains.



Vector diagram of circuit

New Books

Liquid Dielectrics. By Dr. Andreas Gemant. Translated by V. Karapetoff. Pp. 185; figs. 59. London: Chapman & Hall. Price 18s. 6d.

This book is the second of a series of monographs published under the auspices of the Committee on Electrical Insulation of the Division of Engineering and Industrial Research, National Research Council, U.S.A., and it presents a survey of the theory of liquid dielectrics and of their properties as insulators. The author has written the book chiefly for the electrical engineer and only those properties have been included which dielectrically are of interest.

In Chapter I, which deals with the general characteristics of liquid dielectrics, conductivity, dielectric constant and molecular structure are briefly discussed. Essential mechanical and thermal properties, embracing capillarity, viscosity and conduction of heat are given in Chapter II, while Chapter III describes the physico-chemical behaviour of insulating liquids, that is the aspects of solubility and gas absorption, colloidal structure and oxidation. Electrical and optical properties form the subject of Chapter IV, which deals more specifically with conductivity with direct current, dielectric constant, refraction index, dielectric losses and the Kerr electric double-refraction effect. The behaviour of liquid dielectrics in intense electric fields is described in Chapter V under the headings of motion phenomena, chemical changes, ionisation and breakdown. In Chapter VI examples are given of the applications of liquid dielectrics to electrical engineering, these comprising high voltage cables, transformers, high-voltage circuit breakers and control devices for television and for sound films.

Of particular interest are the oscillograms showing cable ionisation at successively increasing voltages, the wave form of total loss current becoming more distorted as the voltage gradient, and with it the ionisation loss, increases. The distortion is shown to be due mainly to the third harmonic which, of course, one would expect from the results of investigations of corona on bare conductors. Interesting photographic records are also given in this chapter of the effects of electrical stresses at different voltage gradients upon cable papers impregnated for different lengths of time, and it is shown that the corona threshold varies from 180 kV/cm. for a one-minute impregnation to 410 kV/cm. for a 12-hour impregnation. A useful list of references to papers on cognate subjects is given. While the book does not break new ground it is a valuable addition to the literature on the subject.

The Modern Diesel. Pp. 184; illustrated. London: Iliffe & Sons Ltd. Price 3s. 6d. net.

One of the most notable features in the realm of engineering science during the past few years has been the rapid development of the high-speed low-powered Diesel engine. It was not so very long ago when for small cylinders, say, below 10 in. in diameter, the semi-Diesel principle had to be employed, and this involved the use of some external source of heat when starting up.

To-day, by the simple expedient of increasing the compression pressure to something in the region of 420 lb. per sq. in., automatic ignition is obtained, even when starting up from dead cold, and by a careful study of the many difficulties introduced when dealing with the injection and combustion of very small quantities of heavy oil it has become possible to produce a "compression-ignition" engine sufficiently small to develop about 10 h.p. per cylinder when running at a speed of 2,000 r.p.m. The industrial possibilities of such engines for operating road vehicles, small sea-going and river vessels and aircraft, as well as for driving electrical generators, are apparent, and as a consequence a large number of different designs have been placed upon the market recently.

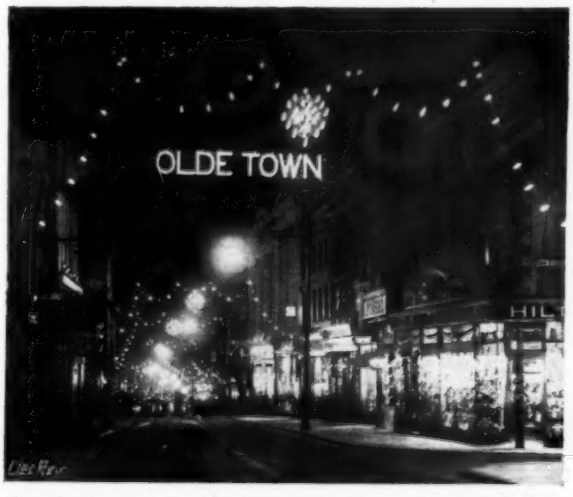
The book under review first appeared in January, 1932, but it very soon became necessary to revise it and bring it up to date. In it the authors have included brief descriptions of no fewer than thirty-seven different designs of engine for driving road vehicles, twenty-three marines types, and nine aircraft engines, all using heavy oil as fuel. In the majority of cases the descriptions are illustrated by photographs and sectional drawings, while in a number of instances perspective drawings are included, which greatly assist in the ready understanding of the text. As a preface to these descriptions there are six chapters dealing in simple language with the principles underlying the operation of the high-speed compression-ignition engine. Owing to the higher efficiency inherent in the Diesel cycle and the use of a cheap heavy oil as fuel, the running costs of the compression-ignition engine is only about one-fifth of the corresponding petrol engine, and its possibilities can be gauged. So far, this type has not been widely employed for driving electrical generators, but there is no *a priori* reason why it should not be so used, and to those who are attracted by the possibilities of such a development this book can be confidently recommended as giving a broad survey of the different designs which are available.

Faraday's Diary, Vols. III and IV. Edited by Thomas Martin. London: G. Bell & Sons, Ltd.

To book-lovers, these two volumes containing more of the "Various Philosophical Notes of Experimental Investigation made by Michael Faraday, D.C.L., and bequeathed by him to the Royal Institution," will afford convincing evidence that scientific and technical books at their best are to-day attaining to excellence of production comparable with the finest that contemporary general literature can provide for the library table. Mr. Thomas Martin, under whose editorial guidance the printed text of the Diary has been prepared from the original hand-written note-books, has bestowed upon the task remarkable care and zeal. The margins are embellished with Faraday's original sketches—occasionally crude, but always explanatory, and sometimes characterised by fascinating delicacy of touch.

Vol. III relates to the period from May 26, 1836, to November 9, 1839, during which Faraday, with amazing versatility, was investigating such diverse matters as the "voltaic condition" of iron, electric discharge in gases, electrified drops, induction, dielectrics, the conductivity of water with admixtures of acids and salts, the magnetic properties of metals, and the Aurora Borealis. Vol. IV contains his entries from November 12th, 1839, to June 26th, 1847. It reveals him continuing his voltaic experiments, pursuing induction, investigating regelation and surface-tension, the solidification of gases, studying lightning, vapour-pressure, nitrous oxide, and diamagnetism. He explored all territory, and wherever he delved he found gems.

It is instructive to be reminded of the desire that actuated Faraday to present posterity with a faithful account of his researches and with the story of the relation of his victories to the achievements of other investigators. He proceeded to this end in three stages. First, there was always the entry in his diary at the time of the experiment. Then followed, as a rule, an account written by him for a scientific journal. Finally, there was revision and a statement in the appropriate section of his collected writings. In 1839 he explained the need that had arisen for bringing the scattered parts of those writings into a harmonised whole. From the material of his diaries, and from his published scientific papers he thus built the permanent authentic record—his *Experimental Researches*.



The Scarborough Christmas illuminations for which a large quantity of "Becantee" lampholders have been installed

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Kempe's Engineer's Year-Book, 1933-34. Pp. 2,623. Illus. London: Morgan Bros., Ltd. Price 31s. 6d.

This is the 40th annual edition of the Year-Book, and a very thorough revision has been carried out. Not only have all the tables and general data been carefully checked and, where necessary, brought up to date, but several entirely new articles have been added, which include one on thermo dynamics by Mr. R. H. Parsons, and another on water turbines by Mr. P. W. Leewer. The new volume has been divided into two main parts, the first containing the sections dealing with technical data and principles, and the other sections giving useful descriptions of various products of engineering firms.

Wireless: Its Principles and Practice. By R. W. Hutchinson. Pp. 308; figs. 220. London: University Tutorial Press, Ltd. Price 3s. 6d.

As this is the second edition of a book which was published only a year ago it may be assumed that the book has already fulfilled a useful purpose. It is an elementary textbook on broadcast reception with a few pages devoted to transmission. The author sets himself the task of giving a student who has no previous knowledge of electricity an insight into the fundamental principles of wireless reception and their up-to-date application in broadcast receivers. From the outset, theory is associated with practical application, which helps to stimulate the reader's interest. Mathematics is avoided throughout, explanations are clear and simply expressed, so far as they go, and the matter is well arranged and attractively set out.

This edition brings the subject up to date as arrangements developed during the last year, such as "Class B" amplification, all-metal valves and automatic volume control, are included in their appropriate places in the text. The book should prove particularly useful to students in technical classes and to amateur experimenters.

The Egyptian Electrical Market

A REPORT on economic conditions in Egypt by Messrs. G. H. Selous and L. B. S. Larkins, Commercial Secretaries at Cairo, has been issued by the Department of Overseas Trade (Stationery Office, 4s. net). Referring to the new schemes executed by the Ministry of Public Works, the report states that the contracts for the North Delta electricity schemes have been extended farther than the works referred to in the last report (July, 1931). The number of electrically driven pumping stations connected to the North Delta "grid" has been increased to eighteen. This includes two Diesel stations which have recently been electrified. In addition, the town of Mansura is receiving an electricity supply from the "grid." The total length of 66,000-V transmission lines has now reached 250 miles.

Capital orders placed during 1932 by the Egyptian State Telegraphs and Telephone Department amounted to an approximate value of £E.105,670, of which the United Kingdom's share was about £E.79,400. The bulk of the orders placed in the United Kingdom were for the installation of an automatic exchange, transmitting stations for the broadcasting service, and a repeater equipment power plant, renovation of an existing automatic exchange, cable, telephone and aerial line material, &c. Continental supplies consisted mainly of wiring, cables, poles and girders.

The Import Trade

Dealing with the import trade, the report states that the competition which United Kingdom manufacturers of electrical material have to meet in Egypt is chiefly due to foreign price and credit terms, as the reliable quality of United Kingdom products is fully recognised. The advantage of this factor, however, except in certain cases in Egyptian Government adjudications, is not sufficiently appreciated to turn the balance in favour of the United Kingdom product when lower foreign prices and greater facilities for payment are in the scale. Unfortunately, in this market, price and appearance count before design and quality.

The total imports of electrical machinery and apparatus in 1932 were valued at £E.635,119, as compared with £E.879,202 in 1931, while imports of generators, motors, and transformers were valued at £E.164,742, against £E.192,627. Belgium was a keen competitor for machinery, motors, cables, &c., but its supplies of other categories of electrical apparatus were unimportant. Belgian interests own most of the tramway systems in Egypt, and their manufacturers therefore enjoy what is practically a closed market to their competitors.

At one time Germany was the strongest competitor in electrical goods, but during the past year or so the local branches of two of the most important German manufacturers have drastically curtailed their activities in Egypt. German manufacturers still retain the market for electro-medical apparatus, though the total imports of this class in 1932 fell from £E.12,932 to £E.8,838. United Kingdom supplies of this line were negligible. Competition from France was unimportant so far as electrical machinery was concerned, but French manufacturers were well placed in the market for sundry electrical apparatus, wiring accessories and certain material for town distribution systems. Italian manufacturers compete in the smaller class of machinery and in supplies of electrical fittings, while Italian fans have dominated the market for several years past. There is scope for United Kingdom manufacturers to enter the Egyptian market for electric refrigerators.

Dutch competition has been chiefly felt in the business in electric cables, particularly the heavy types—underground and submarine, and while Swiss firms offer apparatus and appliances of the smaller types at low prices, they have made little headway except in respect of domestic switchgear. The local demand for electric lamps is mostly met by Dutch, Austrian, United Kingdom, and German makes, but a certain competition in cheap quality lamps, mostly for motor requirements, is now being experienced from Japan. The largest United Kingdom lamp selling organisation in Egypt more than doubled its sales in 1932.

Probable Future Demand

It is difficult to particularise as to the extent and probable development of the demand for electrical machinery, apparatus, and accessories, but it seems safe to assume that the progressive development of the Egyptian Government's various schemes of electrification must bring in its train an increased demand for this class of goods. The difference in prices quoted by Continental manufacturers of such articles as, for example, lampholders, switches, plugs, &c., as compared with United Kingdom quotations is still considerable, but the superiority of the United Kingdom article cannot be challenged. Unfortunately, the present inclination to economy favours the cheap Continental articles on the ground that they serve the purpose for which they are required.

The following table shows the value of the principal electrical imports during 1932, with the increases or decreases as compared with the previous year:—

	1932. £E.	Increase or Decrease. £E.
Apparatus, electrical, not elsewhere specified, and parts, 1,000 kg. or more—		
United Kingdom... ...	14,399	– 35,572
Germany	6,620	+ 5,594
Other countries	1,536	– 5,700
Total	22,555	– 35,678
Apparatus, electrical, not elsewhere specified, and parts, 250 kg. to less than 1,000 kg.—		
Total	9,457	– 35,686
Apparatus, electrical, and parts, 10 kg. to less than 250 kg.—		
United Kingdom... ...	14,275	– 38,929
Belgium	23,054	+ 18,362
France	6,884	– 13,953
Switzerland	3,305	– 474
Other countries	18,219	– 36,978
Total	65,737	– 71,972
Apparatus, electrical, not elsewhere specified, and parts, less than 10 kg.—		
United Kingdom... ...	14,790	– 8,730
France	11,995	+ 3,757
Germany	27,375	+ 11,161
Other countries	23,836	– 3,798
Total	77,996	– 5,124
Apparatus, telegraph and telephone, ordinary—		
United Kingdom... ...	6,934	– 39,025
Other countries	1,563	– 8,017
Total	8,497	– 47,042
Apparatus, telegraph and telephone, wireless—		
United Kingdom... ...	12,904	+ 116
France	623	– 201
Germany	7,060	+ 990
Holland	8,486	+ 4,828
United States	26,365	+ 7,098
Other countries	4,064	+ 560
Total	59,502	+ 13,471
Cable, electric, insulated, submarine and underground—		
United Kingdom... ...	7,325	– 4,759
Belgium	50,276	+ 40,769
France	11,895	– 10,117
Germany	12,688	– 16,918
Holland	9,124	+ 6,484
Italy	2,195	+ 496
Other countries	826	– 1,749
Total	94,329	+ 15,206
Lamps, electric—		
United Kingdom... ...	8,348	+ 4,303
Austria	2,855	– 5,698
France	2,557	– 625
Germany	2,860	– 4,964
Holland	10,939	– 4,485
Hungary	3,783	– 1,829
Japan	2,740	+ 1,167
Other countries	4,785	– 1,311
Total	38,867	– 13,442

Indian Electrical Imports

THE Department of Overseas Trade has published a report prepared by H.M. Senior Trade Commissioner in India on the import trade of that country during the first six months of the fiscal year to September 30th last. This states that the value of imports of electrical machinery totalled 50½ lakhs of rupees, as compared with Rs.91¼ lakhs in the corresponding period of the preceding year.

Dealing with "instruments, apparatus, appliances, and parts thereof," the report shows that the total imports of telegraph and telephone apparatus declined from Rs.116 lakhs to Rs.109 lakhs, the United Kingdom share only falling, however, from Rs.63¾ lakhs to Rs.62¼ lakhs. The electric fan trade fell from Rs.12 lakhs to Rs.10¼ lakhs and the United Kingdom share from Rs.8 lakhs to Rs.7¼ lakhs. Under the heading of electric wires and cables, the total imports advanced from Rs.28¼ lakhs to Rs.31¼ lakhs, consignments from the United Kingdom being slightly improved from Rs.21.4 lakhs to Rs.21.6 lakhs. The imports of gasfilled lamps fell slightly from Rs.7¼ lakhs to Rs.7 lakhs, but the United Kingdom share stood slightly higher at Rs.4 lakhs. Imports of vacuum electric lamps totalled Rs.8 lakhs as compared with Rs.8¾ lakhs last year, but again the United Kingdom share advanced from Rs.2.7 lakhs to Rs.3 lakhs. Electric bulbs for torches were reduced from Rs.1¾ lakhs to Rs.1 lakh in consequence of materially reduced shipments from the U.S.A., Germany and Japan.

The total trade in batteries rose from Rs.5 lakhs to Rs.5½ lakhs, the American share advancing from Rs.2¼ lakhs to Rs.3¼ lakhs, and displacing arrivals from the United Kingdom which fell from Rs.1¾ lakhs to Rs.¾ lakh. Electric carbons (including furnace electrodes) were slightly lower at Rs.2 lakhs, of which the United Kingdom supplied Rs.1¼ lakhs and "other countries" the balance. The trade in accumulators rose slightly from Rs.4.6 lakhs to Rs.4.8 lakhs, the United Kingdom share of which fell from Rs.4.4 lakhs to Rs.3.6 lakhs. Electric lighting accessories were also reduced from Rs.4¼ lakhs to Rs.3 lakhs. United Kingdom suppliers held their own at Rs.1.4 lakhs, but arrivals from Germany fell from Rs.2 lakhs to under Rs.1 lakh. The imports of meters totalling Rs.4¼ lakhs were mainly drawn from the United Kingdom (Rs.3¼ lakhs). Imports of unenumerated electrical goods and apparatus fell from Rs.20½ lakhs to Rs.17 lakhs, the United Kingdom share falling from Rs.10 lakhs to Rs.9¼ lakhs.

In the Courts

IN the Chancery Division on December 12th Mr. Justice Luxmoore had before him a motion on behalf of the Gas Light & Coke Co., Ltd., against the Mayor and Aldermen of the borough of Heston and Isleworth, for an interim injunction to restrain the defendants in connection with the leaving or letting of any building, belonging to them and being in the limits within which the plaintiffs are authorised to supply gas, from making or imposing any restriction with respect to the form of heat, light or power to be used in such buildings. The motion further asked to restrain the defendants from giving any preference to any person on account of his agreeing to take a supply of electricity or from subjecting to any prejudice or disadvantage any person not agreeing to take a supply of electricity, or otherwise from infringing the provision of Section 4 of the Gas Light & Coke Company's Act, 1933.

Mr. Gavin Simonds, K.C., in support of the motion, said the Act prevented local authorities making improper use of their powers so as to compel tenants to take other supplies than those which the company was able to provide. Mr. W. F. Waite, who appeared for the defendants, said he was prepared to submit to an injunction in the terms of the relief asked for and to treat the motion as the trial of the action.

Mr. Simonds asked leave to amend the writ by asking for a declaration that the condition in the electricity supply agreements made by the defendants with their tenants whereby the tenants agreed to pay a standing or fixed charge in respect of electricity to be supplied whether it was taken or not was a condition imposed in contravention of Section 4 of the Act.

Mr. Waite said he was not at the moment in a position to accept an amendment of the writ. His Lordship said he would grant leave to amend the writ and the matter could be mentioned to him again on December 20th.

Vulcan Foundry v. Metropolitan-Vickers Co.

In the King's Bench Division last week the hearing was continued before Mr. Justice Branson of the action brought by Vulcan Foundry, Ltd., against Associated Electrical Industries, Ltd., to recover from the defendants as the successors of the Metropolitan-Vickers Electrical Co., Ltd., £36,584, the balance of the price of the mechanical parts of thirty-one electric freight locomotives, which the Metropolitan-Vickers Co. had contracted to supply for the Great Indian Peninsula Railway. The plaintiffs also claimed a further sum of £1,586 in respect of the manufacture and supply of spare parts.

Mr. C. P. Dodd, the chief draughtsman to the defendants, examined, said that he remembered Mr. Finlayson, chief draughtsman to the Vulcan Co., drawing his attention to the relatively higher cost of Swiss designs, and as he was anxious to avoid any stoppage he might have preferred to have such matters left over, but he never assumed the responsibility of telling the Vulcan Co. to leave them over.

Mr. T. R. Graty, the manager of the traction department of the Metropolitan-Vickers Co., gave evidence that on August 23rd, 1928, at an interview which he had with Mr. Whalley, the question of "reasonable prices" was never mentioned and nothing was said about the question of extras on the main contract owing to departure from G.I.P. practice. With reference to the question of spares the plaintiffs had been paid for the spares at the price at the date of the order, and adding to it the enhanced price that had been agreed to owing to the order being late.

Cross-examined the witness said the Swiss locomotive company's prices for spare parts were on a higher scale than the Vulcan company's. The latter was under an obligation to deliver the spares on the prices which it had quoted, but it said that it was only willing to sell the spares at the prices mentioned in its letter and it had invoiced the spares at those prices.

Mr. F. Lydall (of Merz & Partners, consulting engineers to the G.I.P. Rly.) said the specification was drawn up by his firm and left the design generally at large, so that the tenderers could put forward any proposal they liked. Nothing could be put into the engine, whether mechanically or electrically, without their approval. The designs of particular parts would have to be submitted to them. In his opinion there was no material difference between the locomotive as made and the engine as originally specified.

Cross-examined by Sir Leslie Scott, the witness said it was improbable that any wise business man would offer to manufacture at a fixed price on the terms of the tender without knowing a good deal of detail. The witness having been re-examined, Mr. Singleton said that the evidence concluded the defendant's case, and the hearing was again adjourned.

Mr. Singleton, in summing up the case for the defendants, said that the first question which his Lordship had to decide was whether there was a contract by the plaintiffs to design and build thirty-one sets of mechanical parts for the locomotives for £5,397 each? The second question was whether, if there was such a contract, the plaintiffs were bound by the contract. That second question involved a third, *viz.*, whether there was such an adequate change in the agreement that it was no longer binding on the plaintiffs, enabling the plaintiffs to claim to be paid on a different basis. Then there remained the question of the spares.

On the first question he submitted that there was an agreement varied by subsequent alterations owing to variations by the High Commissioner for India which resulted in a binding agreement between the plaintiffs and the defendants to supply the sets for £5,397 each. It was never alleged, he said, until the action was launched that plaintiffs were not bound by the £5,397 basis and that they were entitled to claim on the basis of "reasonable prices."

Whether the plaintiffs' claim for extras did or did not go through did not matter and did not affect the legal position between the parties. His contention was that what was in the minds of the parties when the agreement was made was first fixed prices plus extras, and secondly evolution of design of the locomotives. The plaintiffs, from the beginning, had realised the possibility of an evolution of the design of the locomotives. Having dealt with the other questions involved in the case, the learned Counsel submitted that the plaintiffs' case failed.

Sir Leslie Scott, replying on behalf of the Vulcan Company, submitted that at the date the defendants alleged there was a contract between the plaintiffs and the Metropolitan-Vickers Company, there was no contractual tie between them at all because no contract had ever been worked out between them and no bargain made. The onus was on the defendants to show that the plaintiffs had agreed to manufacture the mechanical parts for a fixed price and he submitted they had not discharged that onus. The defendants said that there was an agreement for an engine which was to be evolved in the future. To draw such an inference his Lordship would have to have regard to the documents which had passed between the parties before the agreement was alleged to have been made. He contended that there was no definite contract made on July 28th, 1926, as the defendants alleged.

On Tuesday Sir Leslie Scott continued his closing speech for the plaintiffs. He said that the head contract provided that the engineers should be at liberty during the progress of the works to make alterations therein. The contract works were defined by the drawings sent in by the contractors. It was never a contract for a fixed price if alterations were made. If the engineers made any alteration inconsistent with the specification that would in his submission be a variation involving extra payment.

There was nothing in the correspondence which could be said to alter or prejudice the plaintiffs' right to "extras." He (Counsel) submitted what happened was unfortunate because the plaintiffs did not know that it had been sought to change the design, and secondly that they did not know that the Metropolitan-Vickers Co. was falling into line with operations changing the type of design which the consulting engineers thought more suitable for the mechanical parts of the locomotives than the G.I.P. design. The starting point for the design was the Swiss design and Swiss practice instead of G.I.P. practice. He submitted that there was no evidence which could support the suggestion that the plaintiffs had given up their right to the G.I.P. design and their right to extras upon it.

The hearing was again adjourned.

A Slander Claim Settled

In the King's Bench Division on December 6th, Lord Hewart, the Lord Chief Justice, heard the settlement of an action by Vac-Tric, Ltd., vacuum cleaner manufacturers, against Electrolux, Ltd., in which the plaintiff company claimed damages for slander.

Mr. Melford Stevenson stated that a traveller for the defendant company in conversation with a woman in South London, to whom he was endeavouring to sell an "Electrolux" vacuum cleaner, had said that Vac-Tric, Ltd., was in liquidation. That was admittedly untrue, and the defendants had apologised and paid an agreed sum in damages and costs.

Mr. Laski, K.C., for the defendants, read an apology in which his clients expressed their regret that any statement should have been made which reflected on the financial stability of the plaintiff company.

Lord Hewart assented to the settlement.

An Epidemic of Electricity Thefts

Before Sheriff Brown at Hamilton on December 9th over twenty tenants were involved in charges of stealing electricity from the Motherwell and Wishaw Electricity Department. According to the prosecutor a number of the tenants of a housing scheme hit upon a plan to get electricity for nothing. There had been mechanical interference with the electrical installation at the meter, and the tenants had been able to make a loop over the meter and use electricity without it being recorded.

The meters were of the shilling-in-the-slot type, and very little money had been collected from the houses involved. The consumption varied from eight to 64 kWh in the different cases. The husband of one of the accused was an electrician, and his wife was said to have passed on to other women a method of bridging the meter. The method was a very crude one and might easily have been attended with danger to the houses by way of fire. The Corporation became suspicious because of the lack of money in the meters, and a raid was carried out at various houses, and the accused were caught red-handed with the bridging in operation. An agent for the accused said it was not a case of a wife using the electrical experience of her husband. In fact the dangerous and crude methods used showed that the offence had been committed without his knowledge.

Fines of £2 were imposed. A similar penalty was imposed on another accused whose offence had been committed with respect to electricity supplied by the Coltness Iron Co., Ltd.

Business and Industrial Notes

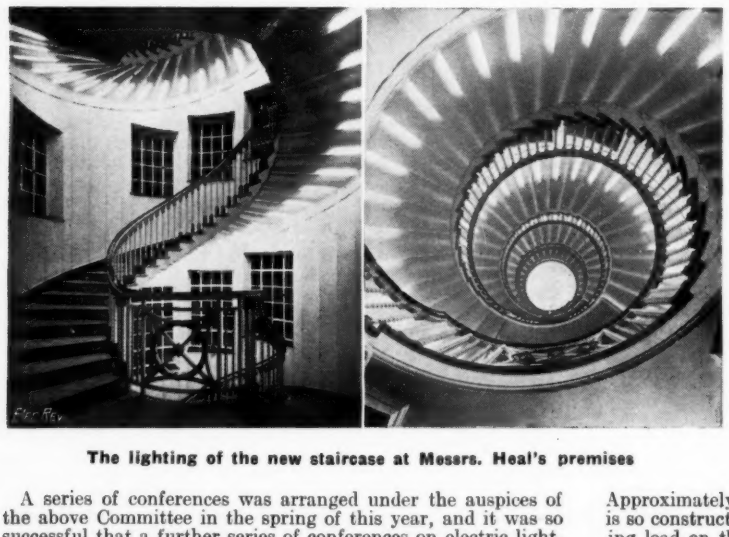
The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Our Overseas Electrical Trade

The Board of Trade Returns relating to imports and exports during November show that the total value of exports of electrical goods and apparatus was £665,408, as compared with £533,056 in November, 1932. Electrical machinery exports were valued at £219,320 (against £261,191). The total was thus £884,728, as compared with £794,247. The imports of electrical goods and apparatus had a value of £317,111 (against £308,424) and electrical machinery imports amounted to £20,195 (£28,694), giving a total of £337,306, as compared with £337,118 in November, 1932.

E.L.M.A. and Co-operation with Architects

Some time ago the Royal Institute of British Architects and the Architectural Association appointed representatives to confer with the E.L.M.A. Lighting Service Bureau on a Joint Lighting Committee. The membership of this Committee is as follows:—Architect Members: Messrs. P. J. Waldram, G. Grey-Wornum, L. H. Bucknell, H. M. Robertson, C. Lovett Gill, and J. C. Shepherd. E.L.M.A. Members: Messrs. W. F. Moir, C. H. Cox, A. H. Carmichael, A. Scammell, C. W. Sully, and W. J. Jones.



The lighting of the new staircase at Messrs. Heal's premises

A series of conferences was arranged under the auspices of the above Committee in the spring of this year, and it was so successful that a further series of conferences on electric lighting is to be held in the Lighting Service Bureau during January, February, and March, 1934. The subjects selected for discussion are as follows: "Lighting Principles," by Mr. W. J. Jones; "Church Lighting," by Mr. H. C. Wheat; "Lighting for Shops and Stores," by Mr. R. O. Ackerley; "Industrial Lighting," by Mr. H. Lingard; "Lighting in Interior Decoration," by Mr. R. O. Sutherland; and "Designing Facilities for Installing Light," by Mr. F. G. Quance.

Irish Free State Electrical Imports

A more active tone again prevailed in the electrical trade in the Irish Free State during October last, the imports of electrical machinery, fittings and cognate apparatus attaining a value of £83,749 as compared with £44,960 in October, 1932. The appended table gives details of the aggregate imports during the first ten months of the current year and shows an increase of £103,988, or nearly 20 per cent.

	First Ten Months. 1932.	1933.
	£	£
Electrical machinery	146,056	182,180
Electric wire and cable	88,628	49,302
Radio sets and parts	115,284	165,613
Electric lighting accessories, fittings and parts	43,834	33,826
Other electrical goods	129,752	199,177
Copper wire	7,618	5,062
Total	£531,172	£635,160

As will be seen, the principal advances are in machinery, radio material and miscellaneous electrical goods.

Hire-purchase and Easy-payment Schemes

The Northern Steel and Hardware Co., Ltd., has prepared schemes for the hire-purchase of radio and electrical appliances, and easy payment for house wiring, including domestic appliances, where these are required at the same time as the house is wired. These schemes include an attractive offer to electrical contractors who act as agents for the company.

Foreign Capital in Poland

The President of Poland has just issued an ordinance to encourage private enterprise and stimulate the investment of further foreign capital in the development of the electrification of the country. According to the *Polska Gospodarcza*, at the beginning of 1933 there were in existence in Poland twenty-two companies formed for the purpose of carrying out electricity supply works, and in these companies the share of foreign capital amounted to 142,000,000 zlotys or 75.5 per cent. of the total. The first place in this respect is occupied by Belgian capital with 58.7 million zlotys, England being fifth with 6.2 millions. Under the new ordinance the Government expresses the hope that foreign capitalists will now take a larger share than hitherto in the work of electrifying the country. Under definite conditions the State will grant facilities in the matter of taxation.

Works Visit

A visit was recently made by over 150 members of the City Livery Club to the works at Cricklewood of Messrs. A. Smith and Sons (Motor Accessories), Ltd. The visitors displayed considerable interest in the manufacture of electric clocks made by the company's subsidiary, Smith's English Clocks, Ltd.

Extensions to a West-End Store

A new extension staircase and lifts have been installed at Messrs. Heal's premises in Tottenham Court Road, W. The electrical work comprises a new a.c. intake and control from which a paper-insulated lead-covered four-core three-phase and neutral cable runs to the central portion of the premises, terminating in a second intake room reserved for the new a.c. distribution. The new circular staircase consists of four flights, constructed in solid concrete; it is lighted by ninety-six 40-W architectural striplights under the soffits of the stairs, thus illuminating the flight directly below, the lamps themselves being the only part of the fitting which shows. The housings for the holders and the tubing were fitted before the concrete was floated in. The top flight is illuminated by concealed lighting from two domes in which are fitted seventy-six 30-W "Maxtrip" lamps and reflectors. In addition to this, there are niches which are flood-lighted. The staircase lighting is on the three-phase supply, and is controlled locally in groups, and in addition to this by an eight-position selector switch in conjunction with a transformer for dimming. From the a.c. switchroom in the basement, mains to two lifts are run to the top of the building, and a quantity of general lighting for the fourth floor, lift lobbies, &c., is installed. Approximately two miles of cable was used in the work, which is so constructed that it is an entirely drawn-in job. The lighting load on the staircase alone is approximately 7 kW. The architects were Messrs. Smith & Brewer, and the electrical work was executed by Messrs. Barlow & Young, Ltd., 19-21, Palace Street, Westminster, S.W.1.

Registered Electrical Contractors

Applications for registration from the following were accepted by the executive committee of the National Register of Electrical Installation Contractors at its last meeting:—

Johnson, W., Bradford, Manchester.
Kettlewell, G. M., Hull.
Prince Bros., Withington, Manchester.
Atkinson, C. A., & Co., Lower Openshaw, Manchester.
Powell, W. J., Swindon.
Sale & Ashton Electric Co., Sale, Ches.
Pemberton & Sturgess, Ltd., South Kensington, S.W.7.
Howard, C., West Gorton, Manchester.
Foulkes, Gornall & Co., Ltd., Shrewsbury.
Miller, J. H., Ashton-under-Lyne.

At the same meeting one application was withdrawn and five were declined.

Industrial Designs Competition

The Royal Society of Arts, in issuing its report on the results of the tenth Competition of Industrial Designs, states that owing to the heavy costs of the movement the Council does not feel justified in continuing to bear alone the burden of financing further competitions. In the advertising and commercial art section this year Messrs. Ferranti, Ltd., offered two prizes for designs for window showcards of either Ferranti radiant fires or synchronous electric clocks. The first prize of £20 was awarded to Mr. E. J. Fenton (L.C.C. School of Photo-Engraving and Lithography), and the second (£10) to Mr. J. Priddey (Birmingham Central School of Arts and Crafts). For a showcard advertising "Thermoid" flexible cord, W. T. Henley's Telegraph Works Co., Ltd., offered a prize of £25, and this was awarded to Miss Jean Miller (Salford School of Art).

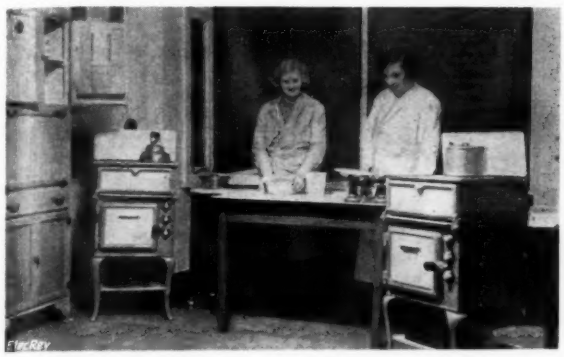
The German Radio Industry

The German Institute for Economic Research reports that both the degree of activity and production and sales of the German radio apparatus industry during the three months ended with October were considerably higher than in the

corresponding period in 1932. In October the output capacity of the manufacturing works was utilised to the extent of 89.8 per cent.—a proportion which had not been reached in the same month in recent years. During the three months almost 500,000 radio sets were disposed of as compared with 300,000 in the corresponding period of 1932. The financial results of the business done in the three months are stated to show an improvement despite the reduction in the prices of radio sets. The Institute considers that the prospects are good.

Cooking Demonstrations at West Hartlepool

Electric cooking demonstrations were given in the Corporation electricity offices, West Hartlepool, during the week ended December 9th by Miss Appleton, of London, on the Jackson "91J" cooker. The audiences assembled at each afternoon



Demonstrating electric cooking at West Hartlepool

and evening session were very encouraging and good business has been the result. The opportunity was taken to give a demonstration of Christmas cooking before members of the E.A.W., at the Grand Hotel. The accompanying illustration sent us by Mr. S. Tillotson, the borough electrical engineer, shows one of the demonstrations in progress.

Australian Tariff on Turbines

The Australian House of Representatives has approved the insertion of a new sub-item in the Customs tariff to cover turbines and parts. In the discussion it was stated that the amendment was to give effect to a recommendation by the Tariff Board. Duties of 45 per cent., British preferential, and 65 per cent., general tariff, had been imposed on such parts as could be made in Australia, but on parts which could not be made in Australia the rates were free for British products and 15 per cent. general tariff.

Swimming Pool Lighting

The accompanying illustration shows the open air swimming pool at Great Amwell, Herts, which is illuminated by means of floodlights made by the General Electric Co., Ltd., equipped with "Osram" lamps. Features of this swimming pool are grottoes and waterfalls, which have been floodlighted to give added beauty to the surroundings.

Control of Appliances in Victoria

The Electrical Federation of Victoria, which represents all sections of the trade, supports the proposed legislation which will provide for the State Electricity Commission becoming the licensing authority for the sale of electrical appliances, the installation of electric wiring, and the registration of electrical contractors. The new Bill will be introduced only if the State Electricity Commission (Trading) Bill, under which the Commission would be prohibited from trading in electrical equipment, is passed, as the Commission could not become a licensing authority for appliances sold by itself. Under the licensing and registration scheme samples of all electrical appliances would have to be submitted to the Commission for approval before any sales could be made to the public. It is also proposed that electrical contractors should be licensed and registered, and that wiremen should also be licensed by the Commission.

Holidays

The London offices of the Jackson Electric Stove Co., Ltd., will be closed from midday on December 23rd, until Thursday morning, December 28th.

Messrs. Bruce Peebles & Co., Ltd., are closing their works on Friday evening, December 29th, and will reopen on January 8th.

The New Charing Cross Hospital Radio Installation

The Radio Manufacturers' Association has presented a mains driven radio installation to the Charing Cross Hospital. This installation, which replaces the battery set put into service in the early days of broadcasting, was manufactured and installed by Radio Instruments, Ltd., and commemorates the work done by the late Mr. Hugh Jones, the pioneer of hospital radio equipment. A tablet to this effect is fitted on the receiver. The receiver consists of high frequency, detector and low frequency stages, and the amplifier provides the power for twelve moving-coil loud speakers and about 500 pairs of headphones.

Trade Announcements

British National Electrics, Ltd., Mossend, Lanarkshire, announce that they have opened new stores and showrooms at 27, Bridge Street, Manchester (telephone: Blackfriars 3824). These premises have been opened for the service of customers in the North-Western area. Modern showroom facilities are provided for the display of cookers, fires, floor and table standards, tubular heaters, and other equipment, including "Universal" products, the sole manufacturing rights of which have been acquired for the British Empire.

Mr. A. E. Sharpe, electrical engineer, has opened premises at 7, The Broadway, Peterborough.

Mr. M. W. Singer, agent for Messrs. George Wade & Son, Ltd., Burslem, has removed to 3, Woodhurst Road, Moseley, Birmingham. (Telephone: South 3252.)

Owing to non-renewal of partnership, the title of the firm of Digby & Fairthorne, consulting engineers, of 6, Queen Anne's Gate, S.W., has been changed to "W. P. Digby & Partners." There will, however, be no immediate change of management.

Messrs. Lionel Robinson & Co., Ltd., of Staple Inn, W.C., have opened a wholesale branch for the sale of electrical, automobile and wireless accessories at 25b, Winckley Square, Preston (telephone: Preston 2057). It is their intention shortly to open further branches in other Lancashire areas.

Strike at Elliott Bros.' Works

Last week over 300 employés at the Lewisham works of Messrs. Elliott Bros. (London), Ltd., ceased work and at the time of our going to press had not resumed. The strike is said to be an "unofficial" one.

Recent Contracts

Messrs. C. A. Parsons & Co., Ltd., have received from the East Rand Proprietary Mines, Ltd., South Africa, an order for a 20,000-kW turbo-alternator, complete with condensing plant. The turbine will develop its power in a single cylinder exhausting into a condenser of the inverted type. The alternator is of special interest as it will have a two-core concentric winding and will generate current at a pressure of 22,050 V.

The English Electric Co., Ltd., has recently received orders from South Africa for electrical equipment. Two of the contracts are for the supply of large equipments for installation in the Crown Mines, and another order is for two large compressor motors. The British Phosphate Commissioners have placed an order for a Fullagar engine set for Ocean Island. The order comprises a type 4Q four-cylinder, mechanical-injection, Fullagar opposed-piston type Diesel engine of 980 b.h.p.

G.E.C. floodlighting at the Great Amwell swimming pool

at 300 r.p.m., direct coupled to a 750-kW, 3-phase, 50-cycle, 550-V alternator.

It is reported that the Southern Railway Co. has placed a contract valued at £200,000 with the Pirelli-General Cable Works, Ltd., Southampton, for the supply of cables and accessories required in connection with the railway company's electrification schemes.

Calendars, Diaries, &c.

The Zinc Alloy Rust-Proofing Co., Ltd., Shakespeare Street, Horsley Fields, Wolverhampton, has sent us a wall calendar consisting of monthly cards with illustrations of buildings, &c., in which the company's sherardising process has been employed.

The 1934 diary of the National Union of Commercial Travellers is bound in dark blue morocco leather, and in addition to special articles on commercial traveller law and agreements, contains a number of road maps in colour.

We have received from Messrs. Mather & Platt, Ltd., an engagement pad for 1934. This has one week to a page and includes a number of illustrations of the company's products.

Blackburn's Assisted Wiring Scheme

The Blackburn Corporation Electricity Department has entered upon an extensive advertising campaign to popularise its assisted wiring scheme. Large spaces have been taken in the local Press, and the lady who was the two-thousandth to sign the requisite forms on December 6th was presented with an electric clock and an electric kettle by the Mayor (Ald. C. A. Critchley), who is chairman of the Electricity Committee. She was Mrs. Whittaker, and our illustration shows the Mayor handing the articles to Miss L. A. Fielden, who is in charge of the electricity showrooms, for her to present to Mrs. Whittaker, who was unable to attend through indisposition. On the Mayor's left is Mr. W. A. Royle, the borough electrical engineer, and behind is Mr. Owen Hives, the chief clerk of the Department.

A presentation at Blackburn to mark the enrolment of the 2,000th consumer under the assisted wiring scheme

Municipal Trading at Brighton

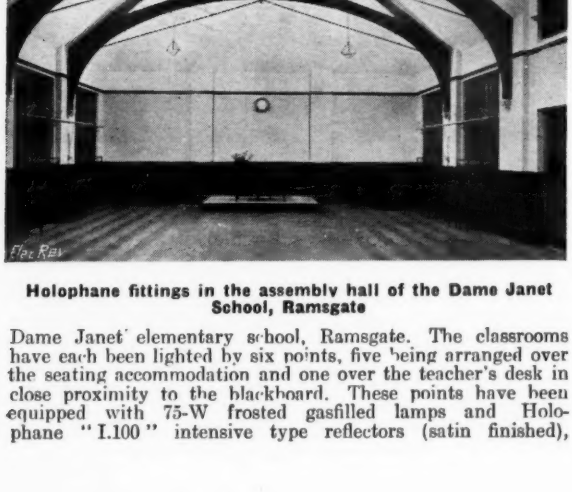
A meeting of the Brighton Corporation was to be held yesterday (Thursday) at which Councillor Wallington was to put down a motion that the showrooms shall not be used for competition with electrical traders in the town, whether wholesale or retail, and that no appliances or other electrical goods shall be sold there except those disposed of under the hire-purchase scheme, and are of a value of not less than £2 10s. per article, or relative to a contract under the assisted wiring scheme. The Committee has issued a report of its discussion with a deputation of electrical contractors of the town on the subject, in which it is stated that the contractors had written asking the Committee not to sell to consumers fittings or apparatus of any kind, and that they were opposed to the hire or hire-purchase of any article costing less than £2 10s. The discussion narrowed down to whether or not the undertaking should retain the right to sell under the 1926 Act, and the contractors wanted to restrict showroom retail sales in every way. It was further stated in the report that contractors were given full discount upon all purchases made in the showrooms, and as the showrooms stimulated the use of electricity to the advantage of contractors, the Committee thought they should both agree to carry on electrical development in the town as it was being carried on to-day. The contractors did not agree to alter their position, and no progress was made. The deputation said it would be willing to consider supplying the showrooms with small apparatus, paying a commission on sales carried out by the Department. The Electricity Committee recommends the continuation of its present policy.

For Sale

Southall-Norwood U.D.C. has for sale air compressors, motors, &c. (See our classified advertisement.)

School Lighting

Particular care has been taken by Mr. E. Barber, architect to the Ramsgate Educational Committee, in conjunction with Holophane engineers in planning the lighting of the new



Holophane fittings in the assembly hall of the Dame Janet School, Ramsgate

Dame Janet elementary school, Ramsgate. The classrooms have each been lighted by six points, five being arranged over the seating accommodation and one over the teacher's desk in close proximity to the blackboard. These points have been equipped with 75-W frosted gasfilled lamps and Holophane "I.100" intensive type reflectors (satin finished), mounted on chain suspensions at a height of 9 ft. above the floor level. An illumination intensity of 6.5 ft.-candles has been attained on this basis, glareless and with an entire absence of hard shadow. In the main assembly hall, Holophane reflector-refractor units "No. 2140" are employed in conjunction with 200-W gasfilled lamps. These are of the totally enclosed type and comprise a top reflector and lower diffusing and refracting plate. The installation has been carried out by the Ramsgate and District Electric Supply Co.

Italian Electrical Imports

The imports of electrical machinery, apparatus and cognate material into Italy during the eight months ended with August last attained a value of £1,192,333 as compared with £1,640,066 in the corresponding period of 1932. There was also a decline during the same period in the exports of similar material from Italy, from £1,134,900 to £470,183.

Local Exhibitions

An electrical exhibition organised by Lancashire Electric Power Co. was opened at Bamber Bridge, on December 7th, by Mr. R. S. Brindle, chairman of the Walton-le-Dale Council.

The Swansea Corporation Electricity Committee, in conjunction with the British Electrical Development Association, is holding an electrical exhibition at the Drill Hall, Swansea, from January 22nd to February 3rd.

Prices of Materials

Messrs. F. Smith & Co. report, December 13th: No change in the price of copper (electrolytic) bars and sheets. Copper (electrolytic) wire rods, £42 10s., 10s. inc.; ditto, h.c. wire, 6¼d., ⅛d. inc. Phosphor bronze wire, 11¾d., ⅛d. inc.

Messrs. James & Shakespeare report, December 13th: No change in the prices of copper bars (best selected) sheet and rod, and English pig lead.

Messrs. Edward Till & Co. report, December 13th: No change in the price of india-rubber, Para fine.

Standard Relays for Railway Signalling

The third and fourth British Standard Specification for relays in the series for railway signalling purposes are now available. They are No. 519 for tractive armature d.c. neutral-polar line relays, and No. 520 for a.c. track relays. Further specifications in the series are at present under consideration. All the British railway companies were represented on the committee responsible for these Specifications, and although non-standard relays will be called for in certain cases for some time to come, it may be hoped that more and more uniformity will gradually be secured by the adoption of the Standard Specifications. Copies of these new British Standards may be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, S.W.1. Price 2s. 2d. each, post free.

Social Event

The staff of the West Gloucestershire Power Co., Ltd., held its tenth annual staff social on December 8th, at the Bell Hotel, Gloucester. Among those present were Mr. W. B. Woodhouse (chairman), Mr. T. Blundell-Brown, Mr. D. Northall-Laurie (directors), Mr. H. S. Ellis (general manager and chief engineer) and Mrs. Ellis.

Canadian Tariff Change

The following articles, imported to be used as materials in Canadian manufactures, are subject to reduced rates of duties: Ceramic insulator cores, not further manufactured than burned and glazed, not printed or decorated and without fittings, when imported by manufacturers of sparking plugs for use exclusively in the manufacture of sparking plugs in their own factories: British preferential tariff, 5 per cent.; intermediate tariff, 10 per cent.; general tariff, 15 per cent.

Wego Condenser Works Extension

Owing to the increased demand for its products during the past few months the Wego Condenser Co., Ltd., has put in hand plans for the extension of its factory to double its present size, and building operations will commence immediately. The new factory will be ready for production in ten weeks' time. It is intended to incorporate further lines in the manufacturing programme.

New Catalogues and Lists

Crossley Bros., Ltd., Manchester.—The November issue of "Crossley Chronicles," describing the company's compressorless Diesel engines at the new West Regional broadcasting station.

Premier Electric Heaters, Ltd., Keeley Street, Birmingham.—Folder No. 252, illustrating "Premier" domestic appliances for Christmas gifts.

Bertram Thomas, Worsley Street, Hulme, Manchester.—A pamphlet containing illustrated particulars of "Tunnel" tubular electric heaters.

Edison Swan Electric Co., Ltd., 155, Charing Cross Road, W.C.—A booklet entitled "Old Rhymes—in a New Light," containing a number of nursery rhymes adapted to draw attention to "Ediswan" lamps. Each rhyme is illustrated—some in colour, and others in outline for children to paint.

J. Dyson & Co., Ltd., 2, Colman Street, E.C.—Price List No. E.33 of electrical accessories.

Mayfair Shades, Ltd., 321-323, Commercial Road, E.—A well-produced booklet illustrating lampshades made in silk, parchment, vellum, rhodoid, &c.

Asea Electric, Ltd., 5, Chancery Lane, W.C.—An illustrated leaflet pointing out the principal features of the "Century" motor for which the company is the sole British agent.

Marconiphone Co., Ltd., 210-212, Tottenham Court Road, W.—A Christmas poster in colour (60 in. by 40 in.) relating to Marconiphone radio sets. Also a "Father Christmas" cut-out bill for affixing to dealers' windows.

Philips Lamps, Ltd., 145, Charing Cross Road, W.C.—A counter card comparing the efficiency of Philips lamps with other types.

James McMillan & Co., Chin House, Surrey Street, W.C.—An illustrated price list (No. 10) of electrical measuring instruments.

Watson & Sons (Electro-Medical), Ltd., 43-47, Park Street, W.C.—Two booklets giving illustrated and descriptive particulars of the "Sunic Standard" mobile ward X-ray outfit, the "Quatralix" shockproof four-valve X-ray outfit, and a booklet entitled "Modern Equipment and its Influence on the Progress of X-ray Therapy."

Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.—Publication No. 54, describing the company's all-insulated "Wethertex" distribution and service system.

Venner Time Switches, Ltd., Kingston By-Pass Road, New Malden.—An illustrated leaflet relating to an automatic fixed-charge or rent-collection meter for insertion in the company's prepayment meter catalogue.

Electroservice, Ltd., 31, Waterloo Road, S.E.1.—An illustrated and priced leaflet of domestic electrical appliances.

Electrical Equipment & Carbon Co., Ltd., 107/111, New Oxford Street, W.C.—A pamphlet entitled "The Heart of the Arc Lamp," with particular reference to "Siemens-Plania" arc lamp carbons, and list "No. S.P.C.21," giving prices of these carbons.

Ferranti, Ltd., Hollinwood, Lancs.—A specimen of a new poster illustrating Ferranti radio receivers, and a circular sent to traders on the company's list dealing with a Christmas sales campaign, which includes advertisements in the national daily newspapers. The opportunity is being taken of introducing three new models—the "Lancastria" radio-gramophone, the "Arcadia Magna" consolette receiver, and the "Arcadia" radio-gramophone.

Brook Motors, Ltd., Empress Works, Huddersfield.—Price List No. 358 and specifications of single-, two- and three-phase starters, and list No. 363 relating to capacitor starters.

Bankruptcy Proceedings

S. Purcell, The Arcade, Goole, Yorks, electrical contractor.—This debtor applied for his discharge recently at the Court House, Wakefield. The receiving order was made in 1925. The Official Receiver stated that the estimated liabilities amounted to £277, but proofs admitted totalled £274, whilst probable claims not proved were £16. The assets available for distribution to the unsecured creditors were £59 and a final dividend of 1s. 10½d. in the £ had been paid. The discharge was granted subject to judgment for £25, and one month's suspension.

R. McKay, 134, Bradford Road, Idle, Bradford, wholesale electrical dealer.—The public examination herein was held at the County Court, Manor Row, Bradford, on December 8th. According to the statement of affairs filed there were ranking liabilities of £116, and a deficiency of £106. Debtor attributed his failure to illness caused by a motor accident, and subsequent loss of business connections. The examination was concluded.

G. H. Matthew, trading in partnership at 448, Woodbridge Road, Ipswich, as "St. John's Radio," radio engineers, previously trading as "St. John's Wireless and Electrical Co.," 759, Woodbridge Road, Ipswich.—The public examination of this debtor was held on December 8th at the Shirehall, Ipswich. Debtor had lodged a statement of affairs showing gross liabilities of £1,001, of which £448 was expected to rank for dividend, and there was an estimated deficiency of £368. Replying to questions debtor said that he commenced business in July, 1931. He incurred losses through defalcations by employés, whilst in June last a fire occurred at the premises, when all his stock, books, &c., were destroyed. The compensation received was insufficient to cover the damage. He transferred the business to 488, Woodbridge Road, and his wife then entered as a partner. The examination was closed subject to the signing of the notes.

G. W. C. Laws, 9, Queen's Road, East Grinstead, lately trading as C. and E. Laws, radio and electrical engineers.—This debtor's public examination took place at the Town Hall, Tunbridge Wells, recently. According to the statement of affairs filed there were liabilities of £897. Debtor attributed his failure to lack of capital, heavy overhead expenses, bad trade, and pressure by creditors.

C. I. Morris, radio dealer, lately carrying on business at Parker Street, Kingsway, W.C.—The public examination of this debtor was opened on December 8th before Mr. Registrar Mellor at the London Bankruptcy Court, the accounts showing liabilities of £651 and assets "cash at bankers, 5s. 4d." The receiving order was made on August 23rd last upon the petition of Pertrix, Ltd. In reply to Mr. Bruce Park, Assistant Official Receiver, the debtor stated that prior to 1922 he was in employment. He afterwards dealt in radio and electrical goods until September, 1931. Since then he had been employed as a traveller in electrical goods. In March, 1933, judgment was given against him in an action brought by the petitioning creditors to recover damages for breach of contract, and in consequence these proceedings ensued. The debtor attributed his insolvency to his liability under the beforementioned judgment. Mr. Park suggested that the debtor had acted as intermediary to cutters, and that he had made quite a good income from that source. The debtor's answers were so unsatisfactory that his Honour warned him against committing perjury, remarking that the bank account showed receipts and payments to the amount of £4,000, in respect of which the Court would require a full disclosure. Mr. Malone also examined the debtor on behalf of the petitioning creditors, and eventually the sitting was adjourned until January 19th next for the debtor to supply cash and goods accounts from January 1st, 1933, to the date of the receiving order in August.

P. Kalis, trading as Ludgate Circus Radio, wireless dealers, 4, Ludgate House, Ludgate Circus, E.C.—The public examination of this debtor was held on December 7th at the London Bankruptcy Court, the accounts showing liabilities of £2,198 against assets of £220, absorbed in the preferential claims. Replying to the Official Receiver, the debtor said he began business in December, 1930, with a borrowed capital of £1,000. The trading was successful until August, 1932, but afterwards declined. In June he offered the creditors a composition of 5s. in the £, but the offer was not unanimously accepted, and these proceedings ensued. The failure was attributed to bad trade, heavy overhead expenses and lack of capital. The examination was concluded.

G. Lewis, electrical and wireless dealer, lately of St. Lawrence Road, Upminster.—The statutory first meeting of creditors was held on December 5th at London Bankruptcy Buildings. According to the debtor's statement he began business in 1924 with £100 capital in stock and cash. He traded under the style of the Upminster Electrical Stores. Some five or six years ago he was joined in partnership by another, but after two years the partnership was dissolved and he (debtor) took over the liabilities and assets estimated at £1,000 and £300 respectively. The debtor attributes his insolvency to bad trade and other causes, and returns his present liabilities at £300, against assets "bad book debts £80." The estate was left in the hands of the Official Receiver to be wound up in bankruptcy.

H. Baxter, colliery electrician, "Breachwood," Ball Green, Staffs (formerly carrying on business at Pittshill as a wireless dealer).—Public examination, January 18th, at the Town Hall, Hanley, Stoke-on-Trent.

S. Colbert, electrician and wireless dealer, 350, Kirkstall Road, Leeds.—Public examination, January 9th, at the County Court House, Leeds.

A. M. Gibson and **W. R. F. Gibson** (Gibson's Wireless), 94, Tavistock Road, Plymouth.—First and final dividend of 4s. 1d. in the £, payable December 12th, at 8, Sussex Terrace, Plymouth.

G. Greenough (Superb Radio Co.), radio specialist, 195A, St. Mary's Road, Garston, Liverpool.—Receiving order made December 5th, on debtor's own petition. First meeting December 15th at the offices of the Official Receiver, Government Buildings, Victoria Street, Liverpool. Public examination, January 16th, at the Court House, Liverpool.

Company Liquidations

Botolph Radio, Ltd.—Under the compulsory liquidation of this company the statutory first meetings of the creditors and shareholders were held on December 5th at Carey Street, W.C., before Mr. J. Barwick Thompson, Official Receiver. A statement of affairs was submitted showing liabilities of £3,471, assets of £2,086, and a deficiency of £5,986 as regards contributories, the issued capital amounting to £4,602. The company was registered in September, 1932, to carry on business as dealers in and manufacturers of gramophones and radio and electrical apparatus. Mr. Maurice Lourain (director) states that on its formation the company acquired a stock of wireless parts for £115 and began to manufacture and sell radio sets. The failure of the company is attributed to the fact that insufficient margin of profit was allowed to cover overhead expenses in fixing the price of wireless sets, to pilfering by employés, burglary, and to damage to stock caused by flooding of the factory at Hammersmith. A resolution was passed for Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C., to act as liquidator with a committee of inspection.

Dionoid Battery Co., Ltd.—Meeting, January 11th, at 6, East Parade, Sheffield, to receive an account of the winding-up by the liquidator, Mr. B. C. Davies.

Western Electric Co., Ltd.—Meeting, January 10th, at Bush House, Aldwych, W.C., to receive an account of the winding-up by the liquidator, Mr. C. A. Fryer.

Electric Conductors & Colours, Ltd.—Meetings, January 8th, at 125, Strand, W.C., to receive an account of the winding-up by the liquidator, Mr. R. A. Hodges.

Chelmsford Radio, Ltd.—Meeting, January 10th, at 42, Duke Street, Chelmsford, to receive an account of the winding-up by the liquidator, Mr. C. S. Polkingthorne.

Dissolution of Partnership

Electrikon, 632, Finchley Road, Golders Green, N.W.—Mr. G. Pink has terminated his partnership in this firm. The business will be carried on by the remaining partner, Mrs. D. L. Brookes, who will attend to debts.

Electricity Supply

Lighting, Domestic, Power

Ashby Woulds.—EXTENSIONS.—The Leicestershire & Warwickshire Electric Power Co. has informed the Urban District Council of its intention to place underground mains in Station Road, Moira, in order to supply electricity to new houses being erected by Messrs. P. W. Peach & Son.

Barrow-in-Furness.—LOAN SANCTIONED.—The Electricity Committee has received sanction to a loan of £5,000 for the supply of meters.

EXTENSION OF SUPPLIES.—Applications for extensions of supplies have been received from Lindale-in-Cartmen, Blawith and Coniston, and preparations are being made for extensions to Finsthwaite. Consent of the local and county authorities has been obtained, but in one case the necessary wayleave has been refused. Negotiations are proceeding with the Broughton Moor Slate Co. with regard to a supply of electricity to its Lag Bank Quarries, Coniston.

Belper.—REQUEST FOR REDUCED CHARGES.—The Urban District Council has decided to join with Ripley Urban District Council in a deputation to the Derbyshire & Notts Electric Power Co. with a view to securing a reduction in the charges for electricity.

Birkenhead.—SUPPLY EXTENSION.—The Electricity Committee has approved schemes for the provision of supply to the Ledsham and Two Mills areas.

Blackburn.—LOAN.—The Corporation is applying for sanction to borrow £16,500, being the estimated cost of installations and electric irons required in connection with the assisted-wiring scheme.

Brighton.—SUPPLY TO POYNINGS.—Before the end of this year, the borough electrical engineer hopes to have ready an electricity supply for the village of Poynings, under a Fringe Order. The flat rate charge will be 8d. per kWh, and appropriate charges are being arranged for domestic contract, commercial purposes and for power.

SUB-STATION.—In view of the increasing load in East Brighton, and the prospective use of a large amount of energy by a new cinema in that part of the town, a new sub-station is to be erected at a cost of £1,929, but the complete work will not be carried out until the demand for it is established.

CINEMA RATES.—Subject to an agreement being signed, the Electricity Committee has arranged to supply a new cinema in the town on the following terms, certain variations being provided for: Fixed charge, £10 16s. per kW of maximum demand per annum; "unit" charge, ½d. per kWh; domestic supplies, ½d. per kWh; maximum demand up to 200 kW, any increase in demand being subject to reasonable notice being given by the consumers.

MAINS EXTENSIONS.—Mains are to be extended at a cost of £3,425.

LOAN.—The Electricity Committee is to apply for sanction to borrow £10,000 for transformer sub-stations.

Burnley.—SUPPLY EXTENSION.—A supply of electricity to Worsthorne and Cliviger is being considered by Electricity Committee.

Canada.—ONTARIO.—The Ontario Hydro-Electric Power Commission has completed an arrangement with the Canada Northern Power Corporation, Ltd., by which the latter will purchase from the Commission for a ten-year period all the additional power it requires to supply the added load of its properties after January 1st, 1934. This contract will entail the first sale of power from the Abitibi Canyon since it was acquired by the Commission for development. It is expected that plant will be installed at Kirkland Lake, an Ontario gold-mining district, by February 1st. A total of 4,500 h.p. will be available the first year, with an additional 4,500 h.p. each succeeding year, which will be adequate to meet the increasing demands on the Canada Northern Power Corporation. It will provide the Commission with an increase in revenue of about $150,000 the first year and $300,000 the second year.

Cardiff.—EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £896, and to erect and equip sub-stations at Beulah Road at a cost of £1,853, Earl's Court Road (£1,580), and Fairoak Road (£1,591).

REDUCTION IN HIRING CHARGES.—The Committee proposes that the hiring rates for reconditioned and superseded cookers shall be reduced by 1s. a quarter and that a reduction of one half of the original charge for the hire of cookers shall be made to those consumers who have had the same cooker for a period of five years.

LOAN.—The Committee is applying for sanction to a loan of £50,000 for mains and £10,000 for sub-stations.

Colchester.—LOANS SANCTIONED.—The Electricity Committee has received sanction to borrow £7,500 for consumers' electrical apparatus, £4,000 for wiring installations, and £22,000 for mains and services.

NEW CABLES.—The Electricity Committee is to lay new cables at St. Botolph's Corner *via* Portland Road, etc., at an estimated cost of £380. The Committee also recommends mains extensions to St. Osyth Beach costing £2,717.

Cookham.—REDUCED CHARGES.—The Cookham & District Electricity Corporation, Ltd., is reducing the flat rate charge from 9½d. to 8d. per kWh as from December 31st.

Crewe.—LOAN SANCTIONED.—The Town Council has received sanction to a loan of £13,000 for mains, services and meters, and has applied for an additional loan of £13,365, for mains and services, including street lighting, and excess expenditure, and £1,388 for meters. The Electricity Commissioners have refused to allow £13,599 from surplus revenue to be used to defray excess capital expenditure.

Darlington.—BRAFFERTON.—The North-Eastern Electric Supply Co., Ltd., has informed the Rural District Council that it would be impossible to give a supply of electricity to Brafferton and Coatham Mundeville on an economic basis even if the whole of the residents, the Institute, schools, farms, church, etc., were to take a supply.

Derby.—LOAN.—The Corporation is to borrow a further £10,000 for the assisted wiring scheme.

Dewsbury.—CHANGE-OVER.—The Electricity Committee is seeking sanction to borrow £53,800 for the completion of the change-over scheme, and £20,000 for mains and services.

Doncaster.—LOAN.—The Electricity Committee recommends application for power to borrow £6,080 for mains extensions on housing estates between Bennetthorpe and Town Moor Avenue, and off the Great North Road near Bentley.

East Grinstead.—LOAN.—The Urban District Council has applied for sanction to a loan of £7,000 for electricity purposes.

Falkirk.—NEW SWITCHGEAR.—Existing switchgear at the Corporation power station is to be replaced by switchgear of a higher rupturing capacity at an estimated cost of approximately £10,000.

NEW MAINS.—A new cable, 3,950 yd. in length, is to be laid from the Blacking Mill sub-station at a cost of £3,917.

France.—NEW HYDRO-ELECTRIC STATION.—The Société de la Huate Isère, Lyons, has recently secured a concession to establish a hydro-electric station to utilise the power of certain waterfalls on the River Isère, near Brevières, in the Savoy Department. It is estimated that power to the extent of 13,900 kW minimum and 21,200 kW maximum will be available.

Golcar.—ELECTRICITY IN THE FUTURE?—In reply to a request for a supply of electricity at Bolster Moor, the Yorkshire Electric Power Co. has informed the Urban District Council that it has no authority to supply electricity for lighting in the area, and it has decided to ascertain the views of intending consumers on the question of a guarantee before again approaching the Huddersfield Corporation on the matter.

Great Bromley.—SUPPLY WANTED.—It is announced that a guarantee of £100 is still required before the Colchester Corporation Electricity Department will commence the supply of electricity to Great Bromley, Burnt Heath, Hares Green, Frating and Balls Green. The cost will be £5,223, of which the consumers must guarantee £890.

Hastings.—LOANS SANCTIONED.—The Town Council has received sanction to a loan of £1,935 for the electricity supply to Winchelsea Beach, and £18,000 for mains, &c., in the rural area, this being part of £39,490 applied for.

Haverfordwest.—INQUIRY.—An inquiry was held recently by Mr. F. Gordon Tuckett into the proposed scheme of the West Cambrian Power Co. to erect overhead cables at Portfield. The case for the power company was conducted by Mr. W. H. Hickin, and objections to the scheme were lodged by the Pembrokeshire County Council and the Haverfordwest Borough Council.

Hazel Grove and Bramhall.—TARIFF REVISION.—The Electricity Committee has considered the application from Orange Cafés, Ltd., and other consumers for a special tariff for lighting, and has decided that an alternative for lighting of £8 per kW of connected load, plus 1d. per kWh metered, be offered to all consumers.

Hove.—STREET LIGHTING.—The borough electrical engineer (Mr. F. Swanbrick) informs us that the Corporation is replacing the whole of the gas lighting in the town by electric lamps, and it is hoped to have the scheme completed by the end of next March. Considerable improvement has already been made to the lighting in Victoria Terrace, Kingsway, where central lamps have been suspended over the roadway.

India.—SCHEME FOR MIRAJ.—A scheme for the electrification of the town of Miraj, in the Bombay Presidency, has been approved by the Durbar.

A MADRAS TRANSMISSION LINE.—The Government of Madras has sanctioned the construction of a transmission line from the Rykara hydro-electric power station to Trichinopoly at a cost of Rs. 20,00,000.

Keighley.—INDUSTRIAL TARIFF.—The Electricity Committee has decided to supply energy for industrial furnaces and for the heating of public and industrial buildings, bakers' ovens, &c., at a charge of 0.5d. per kWh, except between the hours of 3.30 p.m. and 5.30 p.m., during the period from November to February, inclusive; the hours restriction will not apply on Saturdays, Sundays, and public holidays. No supply is to be taken for such purposes during excepted hours pending arrangements with the Central Electricity Board.

MAINS EXTENSIONS.—The Committee is to extend mains to Newsholme and Bailey Park at a cost of £640.

Leeds.—LOAN SANCTIONED.—The Electricity Committee has obtained sanction to borrow £5,750 for buildings and £35,915 for plant in connection with the provision of a sub-station at Whingate.

Lewes.—NEW TARIFF.—The Lewes Electric Supply Co. has adopted an alternative tariff providing for a flat-rate payment according to the size of houses, plus a "unit" charge of 1d.

Leyton.—LOAN.—The Town Council has applied for sanction to a loan of £20,000 for electrical apparatus and installations to be let out on hire.

Liverpool.—SUB-STATION EQUIPMENT.—Approval has been given by the City Council to a recommendation by its Power and Lighting Committee involving the expenditure of £7,990 for a sub-station and equipment, for the supply of electricity to the Finch House Estate.

Macclesfield.—REDUCED CHARGE WANTED.—The Town Council has decided to approach the Macclesfield Electricity Supply Co. for a reduction in the charge for electricity for lighting from 5½d. per kWh to 5d. When the charge was lowered to 5½d. last January the company promised to consider a further reduction to 5d. in June, but this was not made.

Maesteg.—REDUCED CHARGES.—The Urban District Council has decided to reduce the charge for lighting by ½d. per kWh for consumers having prepayment meters, to take effect as from March next, and by ¼d. per kWh for all purposes for consumers having quarterly meters, shop-window lighting excepted, as from January 1st, 1934.

Maidstone.—MAINS EXTENSIONS.—The Town Council has sanctioned mains extensions in Weavering St., where a number of houses are being built, at an estimated cost of £540, and also to the Lunsford Lane area of Larkfield, at an estimated cost of £1,592.

Manchester.—NEW CHIMNEYS.—The Electricity Committee is to erect new chimneys at the Barton power station at a cost of £23,000.

ELECTRICITY IN COUNCIL HOUSES.—The Housing Committee has decided that in future all houses and flats shall be equipped with two 15-A radiator plugs and that as an experiment fifty houses on the Brownley Green area, Wythenshawe Estate, are to be provided with an electric breakfast cooker, washboiler, and panel electric radiators in each of the two principal bedrooms.

PROGRESS DURING OCTOBER.—The monthly progress sheet issued by the Electricity Department shows that during October 2,200 new consumers were added, and 909 existing consumers took additional supplies, representing 5,249 kW, as compared with corresponding figures of 2,148,770 and 4,971 kW during September. About 230 orders for cookers on hire were received, and 205 new cookers were connected, bringing the total on circuit to 12,025. The corresponding figures for wash-boilers were 14, 15, and 546 respectively. It is anticipated that the 100,000th consumer will be connected early next year, and the Electricity Committee has decided to mark the occasion by presenting the consumer with an appropriate electrical appliance.

Oldham.—HEATING OF MARKET HALL.—Mr. F. L. Ogden, the borough electrical engineer, who has been investigating complaints about the heating system in the municipal market hall, has reported that twenty-nine of the heaters are not working out of a total of 186; these are to be replaced by new heaters.

Persia.—TEHERAN.—The Municipal Council is to construct a new power station.

Peterborough.—LOAN SANCTIONED.—Sanction has been received to a loan of £15,000 for mains and services.

Pittenween (Fifeshire).—EXTENSIONS.—The Town Council has agreed to allow the Fife Power Co. to proceed with the laying of cables in those parts of the town in which it had been decided the cables should be underground. Consideration of the question of overload cables has been postponed.

Portpatrick.—SUPPLY IN PROSPECT.—The extension of electricity supply in Wigtownshire is to include the village of Portpatrick, where the supply is likely to be available by February.

Portsmouth.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at an estimated total cost of £769.

LOAN SANCTIONED.—The Electricity Committee has received sanction to borrow £100,000 for mains and services.

Rawtenstall.—SLOT METERS FOR HOUSES.—The Housing Committee has decided that, for the first twelve months' tenancy, slot meters for the supply of electricity be installed in the fifty houses being erected in Holland Avenue for aged persons.

Retford.—DEVELOPMENT LOAN.—The Town Council is applying for sanction to borrow £12,000 for the development of its electricity undertaking.

Rotherham.—CINEMA TARIFF.—The Electricity Committee recommends that the energy for cinema projectors and sound equipment shall be charged for at the same rate as that which applies to small power consumers—2.025d. per kWh.

Scarborough.—SUPPLY TO STATION.—The Electricity Committee has arranged terms for a supply of electricity to the London and North-Eastern Railway at the central railway station.

"ALL-IN" TARIFF DEFERRED.—The Town Council has deferred consideration of an "all-in" tariff.

Southport.—ELECTRIC COOKERS.—The Education Secretary has inquired the terms on which electric cookers could be installed at the domestic centres and it was agreed to install the latest type on loan, free of hire and maintenance charges if the Education Committee would bear the cost of the wiring and control boards and also to replace such cookers from time to time on request by the latest models on payment of £1 for each cooker so replaced.

TARIFF REDUCTION.—The Electricity Committee has reduced the lighting flat rate from 3½d. to 3¼d. per kWh.

REDUCED LIGHTING CHARGES.—The Electricity Committee is to reduce the lighting flat rate from 3½d. to 3¼d. per kWh after the reading of the meters for the December quarter.

Stonehaven.—ELECTRIC LIGHTING.—The Town Council has decided to make an agreement with the Grampian Electricity Co. for the electric lighting of the streets and public buildings.

Stone (Staffs).—LOANS.—The Urban District Council has adopted a hire-purchase scheme in connection with the electricity undertaking, and has applied for a loan of £1,000 for the provision of apparatus. The Council has also applied for a loan of £4,120 for other electrical purposes, and £4,500 for covering overspent balances to September last.

Stratford-on-Avon.—SUPPLY TO BEARLEY.—The Rural District Council has decided to raise no objection to the use of overhead lines by the Leicestershire & Warwickshire Electric Power Co. at Bearley for the supply of electricity.

Sutton Coldfield.—LOAN.—The Electricity Committee is applying for sanction to borrow £1,000 for improving the supply in the Little Sutton and Roughley districts.

Torquay.—REDUCED CHARGES.—The Electricity Committee has decided to reduce the flat rate charge of 10d. per kWh to 8d. per kWh from the commencement of next quarter.

Tynemouth.—LOANS.—The Electricity Committee is seeking sanction to borrow £2,000 for transformers and sub-station equipment and £10,000 for mains and services.

Upchurch.—SUPPLY TO PARISH.—By agreement with the Gillingham Town Council, the Kent Electric Power Co., Ltd., is to give to the parish a supply of electricity. This will be taken from the Corporation sub-station at Rainham.

Wakefield.—TARIFF REDUCTION.—The City Council has decided to reduce the charges for lighting through prepayment meters by ½d. per kWh.

Wallsend-on-Tyne.—EXTENSIONS.—Plans presented by the North-Eastern Electric Supply Co., Ltd., for cables in King's Road, and Churchill Road have been approved by the Town Council.

West Ham.—LOANS.—The Town Council has applied for sanction to loans of £73,220 for extensions of e.h.p. feeders and sub-stations in the Silvertown area, &c., £50,000 for meter requirements, and £3,425 for a cable tunnel.

Wimbledon.—LOANS.—The Electricity Committee is applying for permission to borrow £40,000 for mains and house services; £15,000 for appliances for hire; £10,000 for wiring installations, and £8,000 for new sub-stations, &c.

Wittersham.—SUPPLY TO BE GIVEN.—The Weald Electricity Supply Co. has decided to extend its supply to the parish.

Wrexham.—SUPPLY TO LOCOMOTIVE SHEDS.—The electrical engineer has reported that the Great Western Railway has made inquiries regarding a supply of electricity for power purposes for the locomotive sheds at Croesnewydd. The Electricity Committee has authorised the electrical engineer to continue the negotiations and, if necessary, interview the company's representative in London.

Generation of Electricity

THE official returns rendered to the Electricity Commissioners show that 1,420,000,000 kWh of electricity was generated by authorised undertakers in Great Britain during the month of November, 1933, as compared with the revised figure of 1,230 million kWh in the corresponding month of 1932, representing an increase of 190 million kWh, or 15.4 per cent. The number of working days in the month (*i.e.*, excluding Sundays) was twenty-six, the same as last year.

During the first eleven months of 1933 up to the end of November, the total amount of electricity generated by authorised undertakers was 12,018 million kWh, as compared with the revised figure of 10,972 million kWh for the corresponding period of 1932, representing an increase of 1,046 million kWh, or 9.5 per cent.

The following table gives the figures for each of the first eleven months of the current year and 1932:—

	1932. kWh (millions).	1933. kWh (millions).	Inc. or dec. per cent.
January	1,162	1,336	+15
February	1,133	1,151	+ 1.6
March	1,091	1,160	+ 6.3
April	987	952	− 3.5*
May	895	1,004	+12.2
June	823	885	+ 7.5
July	807	912	+13.1
August	815	928	+14
September	923	1,023	+10.8
October	1,101	1,246	+13.2
November	1,230	1,420	+15.4
Total for eleven months	10,972†	12,018	+ 9.5

* Due to Easter holiday and the fact that Summer Time commenced eight days earlier than last year. † Revised total.

Traction

Cardiff.—TROLLEY-BUSES TO REPLACE TRAMS.—The Corporation has decided to apply for powers to enable it to run trolley vehicles upon all or any of its present and prospective tramway routes; the erection or adaptation of apparatus and equipment for working such vehicles; the abandonment of all or any of the said tramways; and the authorisation of additional trolley-vehicle routes.

Chile.—PROPOSED UNDERGROUND RAILWAY FOR SANTIAGO.—A £2,000,000 underground railway scheme for Santiago is being considered by the Government, to improve metropolitan transport facilities. The new railway, if the present plans are approved, will link up the central Alameda station with Plaza Italia, passing beneath the main traffic arteries of the city.—*Reuter's Trade Service.*

Leeds.—TRAM TRACK RENEWAL.—The Transport Committee is to reconstruct the tram track in Harehills Road at a cost of £11,040.

London.—UNDERGROUND EXTENSION TO ILFORD REQUESTED.—A deputation from the Ilford and District Railway Users' Association was received by Lord Ashfield and members of the London Passenger Transport Board last week. The necessity for the construction of a tube railway to Ilford was urged, but it is reported that the deputation was told that the only way of dealing with that problem was by providing through services not only to the City but to the West End of London as well, and that that dual service could be satisfied only by the electrification of the North Eastern Railway and by the extension of the Central London Railway to some eastern point. With regard to the financial position, Lord Ashfield said that, so far as the Board could estimate, there was not the slightest possibility of the services being self-supporting in the circumstances.

Manchester.—MERGER SCHEME.—A scheme for the formation of a joint municipal transport board for South-East Lancashire and East Cheshire has been approved by the Transport Committee. The board will embrace the transport undertakings of Ashton, Bolton, Bury, Manchester, Rochdale, Salford, Stalybridge and Hyde Joint Board and Stockport, which have a total capital of £11,000,000.

Middlesbrough.—BUSES REPLACE TRAMS.—The Town Council has confirmed the action of the Transport Committee in deciding to replace the trams on the Linthorpe route with buses.

Rotherham.—TROLLEY-BUSES.—The Corporation is to take steps to secure a Provisional Order for the establishment of new trolley-bus routes.

Russia.—MOSCOW'S UNDERGROUND RAILWAY.—The central shaft of Russia's first underground railway has been sunk in the Theatre Square, Moscow. If work goes according to plan, the railway should be ready by November, 1934. The large increase in the population of Moscow has necessitated the construction of the "tube," since during rush hours both buses and trams are considerably overcrowded.

South Africa.—JOHANNESBURG TRANSPORT INQUIRY.—The Johannesburg Tramway and Lighting Committee proposes that the projected inquiry into the municipal transport system shall be widened so as to include the entire working of the power station and the tramway workshops. Sir Guy Granet, who is conducting an inquiry into the South African Railways, is unable to serve on the Johannesburg committee of inquiry, and it is probable that Lord Ashfield will again be approached and asked to recommend a man with transport and electrical experience.

Southern Railway.—FURTHER ELECTRIFICATION REQUIRED.—The Tunbridge Wells and Hastings Councils are to co-operate in making representations to the Southern Railway regarding the electrification of the company's London-Tunbridge Wells-Hastings line.

Sweden.—RAILWAY ELECTRIFICATION.—*Reuter's Trade Service* learns from Stockholm that in reply to a question by the Swedish Minister of Communications, the Railway Board states that it cannot propose any more electrification work after the termination of that now being undertaken. There are, however, lines on which electric traction would be more profitable than traction by steam locomotives provided that these lines did not have to carry the burden of interest on any new capital invested in their electrification. For such work, the cost of which should be borne not by the State Railways but by the Treasury, the Board declares that the following lines are suitable: Laxaa to Charlottenberg at the Norwegian frontier (a distance of 203 km.), Sundsvall-Aange-Ostersund-Storlien (359 km.) and Bräcke-Laangsele (131 km.). These schemes are being investigated and it is expected that the investigation will be finished in sufficient time to allow the Government to submit proposals to the next session of the Riksdag, which begins on January 11th.

Traffic Signals.—The Birkenhead Watch Committee is to install electromatic traffic signals at Argyle Street at a cost of £464.

The Marylebone Borough Council is arranging for traffic signals along the Edgware Road from Marble Arch to Edgware, and along the Finchley Road from Baker Street to Tally Ho! Corner, Finchley.

The Wiltshire County Council has approved of the provision of automatic traffic signals, costing £1,158, at Winchester and Salisbury.

Communications

Belgium.—WIRELESS ON CROSS-CHANNEL STEAMERS.—A radio telephone service giving communication with all the telephone exchanges in Belgium has lately been provided on all the Belgian Government steamers plying between Ostend and Dover.

Great Britain.—A NEW POST OFFICE JOURNAL.—The *Telegraph and Telephone Journal* has ceased publication, and in January the first number of the new *Post Office Magazine* will appear. It will be priced at a penny, and will contain topical illustrated articles on Post Office subjects, pages of pictures, personal notes and news, a page of sports and a radio page, news from every area in England, Wales Scotland, and Northern Ireland, and lists of promotions and retirements.

THE PASSING OF MORSE.—An article by Mr. B. Bradley bearing this title appears in the December *Telegraph and Telephone Journal*. The author says the scheme to abolish morse working in the Post Office may be regarded as having reached its final stage. With the opening of the new phonogram and telephone-telegram equipment at Edinburgh, morse working has now been abolished at all provincial zone centres. The installation of the necessary equipment to cease morse at the area and group centres is well in hand and will be completed early next year. The arrangements for the abolition of morse in London are in an advanced stage, and conversion to telephone working should commence early in the New Year. It will not be many months, therefore, before the morse code and morse working will, for all practical purposes, have been abolished in the British Post Office after being, from almost the inception of communication by electric telegraph until recent years, the principal method used for the transmission of telegrams. Since 1929 a complete revolution in the Inland Telegraph Service has been taking place. Teleprinter working has been extended to supersede all inland Baudot circuits and the busy morse circuits on the one hand, and telephone circuits have been rapidly replacing the remaining lightly loaded morse circuits on the other.

THE B.B.C. AND TELEVISION.—In September notice was given to Baird Television, Ltd., of the termination on March 31st, 1934, of the arrangement under which regular television programmes are transmitted on a medium wavelength using their "30-line" system. Meanwhile, experimental work is being carried out with high definition systems transmitted on ultra-short wavelengths. Such systems offer more possibilities of future development than the low definition systems, although only the latter can be transmitted on medium wavelengths. If, however, the development of high definition television is not sufficiently stabilised by March 31st to justify regular transmissions by any of the methods tested, then the B.B.C. may continue transmissions, probably twice a week, using the low definition method on an ordinary broadcast wavelength, with a view to assisting those members of the public who are experimenting in television. These transmissions would depend on future development, with no guaranteed duration.

RADIO RELAY SYSTEMS.—K.L.M. Radio Relays, Ltd., is considering the question of extending its service from Barrow-in-Furness to Barrow Island.

Tonbridge Urban District Council has granted an application by Wireless Services, Ltd., to install a relay system.

The Norwich Corporation favours the establishment of a relay service in the City in agreement with a company to be formed by local radio traders and represented by the St. Andrew's Wireless Depôt, Ltd.

Germany.—NEW STATIONS.—The new 100-kW Hamburg transmitter will come into operation on January 15th, using a wavelength of 331.9 metres. The new 10-kW Freiburg-im-Breisgau transmitter is nearing completion and will replace the present 0.5-kW plant. The 100-kW Tegel (Berlin) station is undergoing after-midnight tests. It is hoped to inaugurate it before Christmas.

India.—NEW WIRELESS REGULATIONS.—New rules governing the possession of radio apparatus in British India have been issued under the Wireless Telegraphy Act, 1933. They come into force on January 1st. Under these the purchaser of a radio set will have to show his licence to the dealer before he can complete his purchase, and dealers have to keep a register of sales of sets which will have to be produced on demand by an inspector. Dealers will require a licence whether or not they already have a licence under the Telegraph Act. It is hoped that by means of these regulations the present rules regarding the importation of radio apparatus into British India will be simplified.

Italy.—BROADCASTING.—The Società Itale Radio is about to reduce its share capital from 30,000,000 lire to 15,000,000 lire owing to the necessity for making provision for the depreciation of the broadcasting stations which were established in the years 1925 to 1927, and which have become obsolete. It is therefore proposed to write off 10,300,000 lire on the Rome sender, 4,500,000 lire on that at Milan, and 1,100,000 lire on shareholdings, especially the South American investments.

Sweden.—INCREASED POWER FOR MOTALA.—*The Wireless World* states that the Motala station, which relays the Stockholm programmes on 1,348 metres, is to double its present power output to 150 kW in January next.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—Post and Telegraph Department. January 2nd. Telephone switchboard lamps and sockets. (A.Y. 12053.)* Telephone jacks and number plates. (A.Y. 12065.)*

January 9th. Hand-operated telephone generators. (A.Y. 12064.)* Bells and buzzers. (A.Y. 12065.)*

January 16th. Telephone timing clocks. (A.Y. 12085.)* Telephone switchboard keys and accessories. (A.Y. 12081.)* Resistances and reactances. (A.Y. 12083.)*

January 23rd. Telephone trunk test boards. (A.Y. 12091.)*

State Electricity Commission of Victoria. January 8th. Five automatic induction voltage regulators. (A.Y. 12071.)* 115-kW a.c. motor. (A.Y. 12053.)*

January 15th. Triple-braided copper conductor. (A.Y. 12054.)*

January 30th. Telephone handsets. (A.Y. 12113.)*

BRISBANE.—January 31st. City Electric Light Co., Ltd. Land and submarine cable. (A.Y. 12072.)*

February 7th. 44-kV switchgear. (A.Y. 12092.)*

Caithness.—December 21st. County Council. Various works, including electric lighting at new school building, Thurso. Schedules from Messrs. Sinclair, Macdonald & Son, architects, Wick and Thurso (deposit 2 guineas); tenders to Mr. D. W. Georgeson, clerk to the Education Committee, Wick.

Carmarthen.—January 4th. Electric lighting installation at Joint Counties Mental Hospital. (See this issue.)

Cowdenbeath (FIFE).—December 20th. Town Council. Various works, including electrical, at eighty houses. Specifications, &c., from Mr. C. A. Alexander, burgh surveyor, Town House, Cowdenbeath (£2 2s.); tenders to Town Clerk.

Dundee.—December 18th. Corporation Housing Department. Various works, including electric lighting installation at Hilltown scheme. Particulars from City Quantity Surveyor, 91, Commercial Street; tenders to Town Clerk.

Egypt.—ALEXANDRIA.—February 26th. Ministry of Communications. Cable, switchgear, transformers, hauling winches and motors. (A.Y. 12094.)*

CAIRO.—January 16th. Ministry of Education. Electric muffle furnace, electro-plating motor-generator, &c., for School at Giza. (A.Y. 12115.)*

Glasgow.—December 20th. Corporation Education Department. Electrical work at St. Peter's (Boys') School, Stewartville Street. Specification, &c., from Education Offices, 129, Bath Street (£1 1s.); tenders to Town Clerk.

India.—NEW DELHI.—Indian Stores Department. January 8th. A.c. and d.c. table fans. (A.Y. 11967.)*

Knaresborough.—December 30th. Electrical engineering work at Scotton Banks Sanatorium. West Riding Architect, County Hall, Wakefield.

Lanark.—December 19th. County Council. Various works, including electric lighting in connection with the erection of thirty-two houses at Greengairs. Mr. P. C. Smith, county housing and town planning engineer, 13, Clydesdale Street, Hamilton.

London.—ISLINGTON.—January 17th. Borough Council. Electrical and engineers' stores for one year commencing April 1st, 1934. (December 8th.)

Morocco.—CASABLANCA.—December 19th. Municipality, 18,300 electric lamps. (A.Y. 12097.)*

New Zealand.—WELLINGTON.—Posts and Telegraph Department. January 8th. Microtelephone cradles. (A.Y. 12046.)* Telephone jacks. (A.Y. 12045.)*

January 9th. A 100-Ah secondary battery with 60 cells. (A.Y. 12047.)*

January 16th. Thirty-five miles of v.i.r. wire. (A.Y. 12086.)*

January 17th. Forty miles of flameproof telephone jumper wire. (A.Y. 12088.)*

January 30th. 300 Planté positive battery plates. (A.Y. 12104.)* Two hot-cathode type rectifiers. (A.Y. 12106.)* Twenty 180 ohm resistance spools. (A.Y. 12105.)*

January 31st. One stationary battery of twelve unburnt cells. (A.Y. 12107.)*

February 5th. Seventy-five tons of hard-drawn copper wire. (G.Y. 13208.)*

February 6th. 71,000 dry cells for telephone use. (A.Y. 12101.)*

February 13th. Twenty-four 0-8430 ohm rheostats. (A.Y. 12103.)* Fifty miles of tinned copper v.i.r. wire. (A.Y. 12108.)*

January 16th. Public Works Department. Four 1,500-kVA transformers. (A.Y. 12017.)*

CHRISTCHURCH.—January 11th. City Council. Single-phase and three-phase power transformers. (A.Y. 12089.)*

Northern Ireland.—BELFAST.—December 15th. Corporation. Electric lighting installation at Lancaster Street School. Town Clerk (deposit £1 1s.).

December 18th. Wiring and connecting up existing electrical plant at refuse destructor works. Town Clerk.

Persia.—TEHERAN.—January 7th. Municipal Council. Boilers, turbo-alternator sets, switchboards, transformers and cables, in connection with a proposed power station. (A.Y. 12079.)*

Portsmouth.—December 15th. Electricity Department. Eight 200-kVA and two 100-kVA three-phase transformers and two 500-kVA Scott-connected transformer groups. (December 1st.)

South Africa.—JOHANNESBURG.—January 15th. Railways and Harbours. Train lamps and fittings. (G.Y. 13168.)*

Southend-on-Sea.—December 28th. Electricity Department. Transformer kiosks. (December 8th.)

Skipton.—December 21st. Rural District Council. Electric wiring of twenty-eight houses at Gargrave and eighteen at Cononley. Tenders to Mr. A. Rodwell, Council Offices, Granville Street.

Swansea.—December 20th. Electricity Department. Boiler feed pumps, &c. (November 24th.)

Tottenham.—January 16th. U.D.C. Renewal of electrical installation in the Town Hall and Central Baths. (See this issue.)

Uruguay.—MONTEVIDEO.—January 8th. State Electricity Supply and Telephones Administration. Two automatic telephone exchanges and a "complaints" indicator desk. (A.Y. 12118.)*

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* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Brighton.—Electricity Committee. Accepted. H.p. steam mains and feed piping (£7,742).—Babcock & Wilcox, Ltd. Steam and feed valves (£3,305).—Dewrance & Co., Ltd.

Watch Committee. Recommended. Electromatic signals (£388).—Automatic Electric Co., Ltd.

Cardiff.—Water Committee. Accepted. Electric lighting installation at Blackweir depôt (£210).—E. L. Smith.

Electricity Committee. Accepted. Three transformers (£960).—Ferranti Ltd. Switchboard (£438).—Allen West & Co. Emergency tripping battery and switchgear (£261).—Britannia Batteries, Ltd.

Markets Committee. Accepted. Electrical stunning apparatus.—General Radiological & Surgical Apparatus Co., Ltd.

Colchester.—Transport Committee. Accepted. Electrical installation at transport depôt (£109).—A. P. Dean.

Dumfries.—Town Council. Accepted. Kiosk sub-station (£266).—Crompton Parkinson, Ltd.

Hull.—Water Committee. Accepted. Electric lighting installation at Cottingham pumping station (£226).—T. Hicks & Sons.

Telephones Committee. Accepted. Cable (£534).—British Insulated Cables, Ltd. Bronze wire (£264).—F. Smith & Co. Private branch automatic exchange (£1,297).—Standard Telephones & Cables, Ltd. Table telephones (£388).—General Electric Co., Ltd.

Liverpool.—Corporation Health Committee. Accepted. Electrically driven press for baling of waste paper (£135).—C. Booth & Co., Ltd.

London. — SOUTHWARK. — Electricity Committee. Recommended. Cables for twelve months (£2,767).—Hackbridge Cable

L.C.C.—Mental Hospitals Committee. Accepted. Electrical work at Leavesden Mental Hospital (£1,848).—Buchanan & Curwen, Ltd.

Manchester.—Electricity Committee. Accepted. 400-V a.c. sub-station switchgear during a period of twelve months.—B. Thomas, Ltd.

Education Committee. Accepted. Electrical installation at Chorlton Park Municipal School extension.—S. H. Heywood & Co., Ltd. Gear for electric lift at College of Technology.—W. Wadsworth & Sons, Ltd.

Tunbridge Wells.—Town Council. Accepted. Automatic traffic signals (£850).—Automatic Electric Co., Ltd.

Tynemouth.—Corporation. Accepted. Cable (£213).—Macintosh Cable Co., Ltd. Voltage regulator for the Percy Main substation (£117).—Ferranti, Ltd.

Wimbledon.—Highways Committee. Recommended. Traffic control signals (£331).—Automatic Electric Co., Ltd.

Electricity Committee. Accepted. Neon facia sign for new Maldens & Coombe showroom (£122).—Electro Luminations, Ltd. Transformers (£1,430) and one sheet-steel kiosk (£125).—Foster Engineering Co. E.h.p. switchgear (£928).—A. Reyrolle & Co. H.p. switchgear (£578).—English Electric Co., Ltd. L.p. switchgear (£929).—Geo. Ellison, Ltd.

Forthcoming Events

Birmingham Electric Club.—Friday, December 15th. Grand Hotel, Birmingham. 7 p.m. Annual meeting.

Rugby Engineering Society.—Friday, December 15th. Co-operative Hall, Rugby. Reception and ball.

Institution of Electrical Engineers.—Monday, December 18th. Institution, London. 7 p.m. Informal meeting. Discussion on "Modern Developments in X-ray Work." Opened by Mr. G. T. Loughborough. Thursday, December 21st. 6 p.m. "Electromagnetic Phenomena in High-voltage Testing Equipment," by Mr. B. L. Goodlet. (*North-Eastern Centre*).—Friday, December 15th. Grand Assembly Rooms, Newcastle-on-Tyne. 7 for 7.30 p.m. Annual dinner and dance. (*London Students' Section*).—Saturday, December 16th. 2.30 p.m. Visit to Messrs. Watney, Combe, Reid & Co., Ltd., Pimlico. Tuesday, December 19th. Institution, London. 6.15 p.m. "Some Aspects of Television Reception," by Mr. T. H. Bridgewater. (*North Midland Students' Section*).—Saturday, December 16th. 3 p.m. Visit to Messrs. Marshall, Kay & Marshall, Dewsbury. (*South Midland Students' Section*).—Monday, December 18th. James Watt Memorial Institute, Birmingham. 7 p.m. "Carrier Current Telephony," by Mr. D. R. Turner. (*Western Centre*).—Monday, December 18th. Bristol. "The Application of Automatic Voltage and Switch Control to Electrical Distribution Systems," by Messrs. W. Kidd and J. L. Carr. (*North-Western Centre*).—

Tuesday, December 19th. 17, Albert Square, Manchester. 7 p.m. "Electromagnetic Phenomena in High-Voltage Testing Equipment," by Mr. B. L. Goodlet. *(Scottish Centre).*—Tuesday, December 19th. 39, Elmbank Crescent, Glasgow. 7.30 p.m. "The Cathode-Ray Oscillograph and some of its Applications," by Mr. G. Parr.

Association of Supervising Electrical Engineers.—Tuesday, December 19th. Lighting Service Bureau, W.C. 7.15 p.m. "Shoddy Installation Work" by Mr. A. H. Dykes.

Edinburgh Electrical Society.—Wednesday, December 20th. 4, Queen Street, Edinburgh. 8 p.m. "An Engineer's Impressions of Korea and Japan," by Mr. J. Lindsay.

British Electrical Development Association.—Wednesday, December 20th. Caxton Hall, S.W. 7.30 p.m. "The Art of Public Speaking," by Mr. Elliott Stone.

Notes

The Electrical Engineers' Ball

We have already announced that the next Electrical Engineers' Ball will be held at Grosvenor House, Park Lane, W., on Friday, February 9th, 1934, the day after the annual dinner of the Institution of Electrical Engineers, and will be on the same lines as those of the previous balls. Tickets are now available and, as in the past, will be obtainable, price one guinea each, from any member of the General Committee. This Committee is a very full one. The list, which comprises seventy-nine names, includes the members of the Committee of Management of the I.E.E. Benevolent Fund, under whose auspices the ball is now being managed. The following gentlemen are members of the Executive Committee: Messrs. J. R. Cowie, W. G. Hendry, C. W. Hill, P. V. Hunter, J. W. Leach, A. M. Sillar, and J. W. J. Townley.

North Wales Engineers' Dinner

At the annual dinner of the North Wales Electrical and Communication Engineers held at the Castle Hotel, Bangor, talks conducted by a telephone with Cairo and Berlin were amplified so that every word could be distinctly heard throughout the room. Mr. P. J. Robinson (city electrical engineer, Liverpool) first spoke to Mr. Newport, the chief engineer of the radio station at Cairo, mentioning the nature of the gathering, and that Col. Lee, engineer-in-chief of the G.P.O., was present. The talk to Berlin with Dr. Dietze, head of the broadcasting service, was over land lines, and this was undertaken by Mr. J. H. Watkins, of Bangor.

The Physical Society's Exhibition

The twenty-fourth annual exhibition of scientific instruments and apparatus, arranged by the Physical Society, will be held on January 9th, 10th and 11th, at the Imperial College of Science and Technology, South Kensington, S.W.7. The leading manufacturers of scientific instruments will exhibit their latest products in the trade section. The research and experimental section will contain contributions from most of the important research laboratories in Great Britain, and there will be a special sub-section devoted to experiments of educational interest. In addition, the work submitted for the Craftsmanship Competition by apprentices and learners will be on view. Discourses will be delivered each day at 8 p.m. as follows:—January 9th, Mr. R. S. Whipple, M.I.E.E., "The Evolution of the Galvanometer"; January 10th, Mr. J. Guild, A.R.C.S., "The Instrumental Side of Colorimetry"; and January 11th, Sir J. Ambrose Fleming, D.Sc., F.R.S., "The History and Development of the Thermionic Valve."

Members of institutions and scientific societies may obtain tickets (which will be necessary for the first two days) from their secretaries; tickets may also be obtained direct from the Exhibition Secretary, 1, Lowther Gardens, Exhibition Road, S.W.7.

The Consulting Engineers' Dinner

The annual dinner of the Association of Consulting Engineers was held at St. Stephen's Club, S.W.1, on December 7th, when Mr. A. M. Sillar (chairman of committee) presided over a gathering of over 180 members and guests. The toast of "The Houses of Parliament" was proposed by Mr. W. T. Halcrow and responded to by Lord Meston and Sir Edward J. Campbell, M.P. (Parliamentary Private Secretary to the Postmaster-General). In proposing "British Engineers," Major Sir Archibald Boyd-Carpenter, M.P., cited several engineering achievements of men from this country in various parts of the world. He suggested that these were not always appreciated at home. Responding, Mr. A. E. L. Chorlton, M.P. (president, I.Mech.E.), said that engineers through their work were the foundation of the State; he expressed the view that the professional status of engineers should be recognised legally, like that of medical men. Sir Cyril Kirkpatrick (past-president, Inst.C.E.), also responding, referred to the friendly relations between the Association and the other technical institutions.

Sir Lynden L. Macassey, K.C., giving the toast of "The Association," referred to three of its principal activities, *viz.*: (1) The raising of the status of the consulting engineer, which it was not open to the other institutions to do on account of income tax difficulties; (2) the prevention of municipalities from advertising for consulting engineers; and (3) the adoption of model forms of contract, which reduced the scope for litigation. He paid a tribute to the work of Mr. A. H. Dykes as honorary secretary—a post which he had held since the inception of the Association in 1912 except for the year in which he was chairman. Mr. A. M. Sillar, in response, said that there was still a number of engineers practising as consultants who were not members of the Association on the ground that they would "get nothing out of it," but among their members were almost all the past-presidents of the Institutions of Electrical, Civil and Mechanical Engineers who were engaged in consulting work. He also added his tribute to the work of the Association and Mr. Dykes with whose name he joined those of Messrs. S. R. Raffety and S. C. Lewis, the hon. treasurer.

Failure of Supply in North-West London

An interruption of supply from the Willesden generating station of the North Metropolitan Electric Power Supply Co. occurred at 5 p.m. on December 6th and lasted for an hour and twenty minutes. The areas affected included the suburbs of Willesden, Hendon, Edgware, Mill Hill, Wembley, Sudbury and Kingsbury. Captain J. M. Donaldson, chief engineer to the company, informs us that the primary cause of the breakdown was the failure of a transformer associated with a 1,000-kW rotary convertor running on traction load. Although the transformer caught fire, the flames were quickly put out with the chemical extinguishers kept in the station, but the resident engineer was unfortunately overcome by the fumes from these in the confined space. The main trouble was due to some oil-cooled current transformers on the older section of the 11-kV switchboard which became so heavily loaded that they exploded and caught fire before the switch could trip, thus involving the whole of this section of the switchgear with its connected alternators and transformed supply from other sources, while some slight damage to the secondary wiring in the immediate neighbourhood of the damaged section put its associated apparatus out of action. The spread of the breakdown was not due directly to the fire as there was no inflammable material in the neighbourhood, but to the smoke from the burning oil, which, passing down the passage-way, sooted the insulators, which had to be cleaned before the board could be made alive again.

Certain supplies were given at once from an ironclad switchboard which was unaffected. Resumption of the other supplies would have been quicker if a Wembley-Wealdstone interconnector had not been out of commission for the replacement of old switchgear. Most of the current transformers on the 11-kV switchboard are of the compound-filled ironclad type, which are being substituted for the oil-cooled type with wound primaries, and those which failed were to have been replaced. The position at Willesden is complicated by the different network systems which it supplies, *viz.*, d.c. local load, d.c. traction, and 3-kV and 11-kV a.c. systems.

Fatalities

An inquest was held on December 7th at Acton on Albert William Landon, an attendant at Old Oak (Great Western) sub-station, who received a fatal electric shock on November 22nd. Mr. C. Rawlins, sub-station inspector, said that Landon was carrying out special pressure tests and he asked him to make preparations for isolating a power coupling cell to make it safe for the fitter. He was of the opinion that Landon entered the cubicle, believing he had made the conductors dead. Mr. F. Margatroyd, Home Office electrical factory inspector, said that the locking system of the sub-station was out of date and extra supervision was necessary in such a system. Mr. Rawlins maintained that the system was perfect for the special requirements of the sub-station. The jury found that death was due to burns and shock accidentally caused, and added a rider that more supervision and a safety device should be used.

A fatality recently occurred at the Billingham-on-Tees works of the I.C.I. Fertiliser and Synthetic Products, Ltd. According to the evidence at the inquest held on December 7th Patrick McGral was working in a pit by the light of a portable electric lamp. It was fitted with an earth wire, but it appeared that the head of the lamp had got slightly twisted, breaking the wire. The break caused one of the current wires to touch the steel casing of the lamp. When McGral touched the lamp he received a fatal shock. Mr. H. G. Frampton, Electrical Inspector of Factories, told the coroner that the earth wire was according to the regulations. William Bond, foreman electrician, stated that the lamps were minutely examined at short intervals and superficially examined every day. This lamp had been tested before use and found to be in order, and even after the accident tests proved that the fault was intermittent. It was an accident that could not be foreseen. The Coroner returned a verdict of "Accidental death."

Appointments Vacant

Female showroom assistant and cookery demonstrator for Swinton and Pendlebury Electricity Department.

Showroom assistant for Eastbourne Electricity Department.

Principal for the Maclagan Engineering College, Lahore, for the Government of the Punjab.

Sales engineer for Dumfries Electricity Department.

(See our classified advertisements.)

Makers' Names Wanted

THERMOCIT water heater.
MONARCH wash-boiler.
MAXWELL batteries.
ELECTRO FAVORIT vacuum cleaner.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. J. C. Denison-Pender, governor of Cables & Wireless, Ltd., and chairman and joint managing director of Imperial & International Communications, Ltd., has been gazetted an Honorary Colonel of the Royal Corps of Signals (56th (1st London) Divisional Signals).

[*Lafayette*

Mr. W. Fraser, who has resigned his position as joint managing director of Messrs. Johnson & Phillips, Ltd.

Bailie R. Scott was appointed chairman of the Ayrshire Electricity Board in succession to **ex-Bailie D. Orr,** and **Provost H. Smith** was appointed vice-chairman, at a recent meeting of the Board. After the meeting, the members and officials, together with friends, paid tribute to ex-Bailie D. Orr, who, owing to his retirement from Kilmarnock Town Council, automatically resigned from the chairmanship of the Board. Bailie R. Scott, the new chairman, presided, and presented ex-Bailie Orr with an armchair. In performing the ceremony he referred to the fact that Mr. Orr had been a member of the Board since its constitution almost ten years ago, and during that time had acted for a number of years as convener of the Engineering Committee, and for the last year as chairman of the Board.

Mr. J. McGrath, late of Electric Lamp Factors, Ltd., has been appointed manager of the new Preston branch of Messrs. Lionel Robinson & Co., Ltd. **Messrs. Bennett, Marples** and **Jameson,** also late of Electric Lamp Factors, Ltd., have been appointed representatives of the company.

Mr. Julian C. Smith, LL.D., M.E., has been elected president of the Shawinigan Water and Power Co. Mr. Smith succeeds Mr. J. E. Aldred, of Boston, who was recently appointed chairman of the board of directors. He joined the company as an engineer when its first power house, at Shawinigan, was being constructed.

Mr. C. S. Merriman has joined Messrs. J. A. Crabtree & Co., Ltd., Walsall, and has taken over the control of their Manchester district office at 10, Dolefield, Deansgate.

Sir William Ray, the executive chairman of E.D.A., pursuing his policy of meeting members of the various area committees of the Association, conferred with members of the North Midland Area Committee at a meeting held in Leeds on December 6th, under the chairmanship of Mr. T. Roles, the Bradford city electrical engineer and manager. Sir William lunched at Bradford with the Lord Mayor, Captain A. W. Brown, who is area officer for the North Midland Area of E.D.A. Others present included: Mr. S. E. Fedden, manager of the Mid-East England Area of the national grid scheme; Mr. N. McLean, Harrogate borough electrical engineer, who is vice-chairman of the North Midland Area Committee of the E.D.A.; Ald. J. W. Longley, chairman of the Bradford Corporation Electricity Committee; and Mr. C. R. Tattam, the Bradford City tramways manager. Sir William referred to the tendency in municipalities which owned both gas and electricity undertakings to have them under one committee. He said that the stoppage of competition could be carried too far until a state of stagnation was reached.

Sir William Ray with Mr. T. Roles, city electrical engineer, Bradford

Mr. W. Butterworth, who has been station superintendent at the Middleton (Lancs) Corporation electricity works since the undertaking was commenced, has resigned, and the Corporation has tendered him its thanks for his loyal service.

Mr. F. Jones, late manager of the Marconiphone branch in Dublin, has been appointed Metropolitan area manager to the Marconiphone Co., Ltd. Mr. Jones joined the Sterling Telephone & Electric Co. in 1920, as London representative, and in 1923 went to Belfast as that company's branch manager. When the Sterling Company was absorbed by the Marconiphone Co., he went to the West of England as Marconiphone representative. He was one of the prime movers in the formation of the Sales Department in 1929, and was actively engaged in sales development work until his appointment as branch manager in Dublin in August, 1930.

Prof. F. G. Baily, who has been elected chairman of the Engineering Section of the British Association for 1934

Alderman H. K. Beale was reappointed chairman of the South-West Midlands Advisory Joint Committee at a meeting held on December 5th. He has held this position since the Committee was established in June, 1923.

Mr. J. A. Hunn, whose appointment as local director of Laurence, Scott & Electromotors, Ltd., was recorded in our last issue

Mr. E. W. Hudson, who has been solicitor to the Electricity Commission since shortly after its inception in 1919, is severing his connection with Savoy Court as from January 1st. We are informed that Mr. Hudson has found his combined work, on behalf of the Commission and the Ministry of Transport, too exacting, and that he intends to resume private practice.

Mr. W. G. Marks, general manager of the Nottingham Corporation transport undertaking, has been appointed general manager of the Liverpool Corporation tramways and motor omnibus undertaking at a salary of £2,200, and **Mr. C. G. Jackson** has been appointed deputy tramway manager.

Mr. A. Stanley Wilson, A.M.I.E.E., who has for many years been connected with the electrical industry in the North-West area, as branch manager for the British Thomson-Houston Co., and also for the Edison Swan Electric Co., Ltd., and who has for some time past represented the interests of British National Electrics, Ltd., has now been appointed Manchester district manager for the last-named company at its new showroom and counter stores, 27, Bridge Street, Manchester.

Messrs. C. E. Denny and **F. W. Jones** have resigned from the board of Messrs. Gabriel Wade & English, Ltd. **Mr. J. Sherborne** has been elected to the board and appointed joint managing director, and **Mr. E. A. Udall** has been elected deputy chairman.

The directors of the Commonwealth Edison, Public Service of Northern Illinois, People's Gas Light & Coke, and People's Gas Subsidiary, are stated by the *Electrical World* to have voted to discontinue as from December 31st the aggregate $21,000 in annual pensions paid to **Mr. Samuel Insull.** It is said that Mr. Insull's refusal to return from his Greek refuge initiated the action.

Mr. H. J. Suggars, one of the early members of the London Hospital's X-ray staff, who has twenty-three years' service to his credit, has undergone further radium treatment for X-ray cancer. He has had forty applications of radium since he first became a victim of his early work in X-rays.

Obituary

Mr. H. H. Westinghouse.—Mr. Henry H. Westinghouse, brother of the late Mr. George Westinghouse, died at Goshen, New York, recently, at the age of eighty years. He began his career in 1872 in the Westinghouse Air-Brake Company, and was responsible for many improvements in the air brake invented by his brother. He subsequently became chairman of the company. He was the inventor of the single-acting steam engine that was extensively applied in the electric power plant industry.

Mr. A. Thompson.—The death occurred on November 24th, at his residence, Wyatts Road, Chorleywood, Herts, of Mr. Arthur Thompson, head of the firm of A. Thompson & Son, electrical engineers, of Chorleywood. He was sixty-five years of age.

Mr. A. Reame.—The death occurred at Lincoln on December 8th, at the age of sixty-two years, of Mr. Albert Reame, A.M.I.E.E., who went to Lincoln twenty-two years ago as works engineer to Messrs. Clayton & Shuttleworth, Ltd. He was previously at Ashton-under-Lyne with the National Gas Engine Co., Ltd. Included in the work he undertook was the purchase at Ulverston and the dismantling and re-erection in Lincoln of the electrical plant for the firm's power station, which was later taken over by the Lincoln Corporation. When the works of Messrs. Babcock & Wilcox, Ltd., at Lincoln, were closed down he became a consulting engineer in the city.

Mr. A. E. Ferriday.—The death has occurred, at the age of thirty-nine, of Mr. Alma Ernest Ferriday, who had been for about twenty-one years on the staff of the British Thomson-Houston Co., Ltd., at Rugby. He was engaged in the progress section of the control gear factory.

Mr. Ormond Higman, formerly chief electrical engineer of the Canadian Department of Trade and Commerce, died at Ottawa on November 9th. Mr. Higman, who was eighty-three years of age, attained international prominence in the development of standardisation of gas and electrical measurements.

Will.—Sir Gilbert C. Vyle, managing director of Messrs. W. & T. Avery, Ltd., and a director of other companies, left £23,112 (net personalty £12,449).

Parliamentary News

(BY OUR SPECIAL REPORTER)

ON December 7th Mr. Whiteside asked the Minister of Transport whether he was aware that many road accidents were caused through inadequate signalling on the part of drivers; and whether he would consider making it obligatory for all tramcars, omnibuses, delivery vans, and lorries to carry an electric signalling device.

Lieut.-Col. Headlam, who replied, said he was aware that inadequate signalling, like other faults on the part of drivers, might cause accidents. Proper signals by hand, however, were, in his opinion, adequate for their purpose and the Minister did not, as at present advised, propose to make the use of electrical or mechanical signals compulsory. This was in accordance with the unanimous recommendations of the Departmental Committee on Traffic Signs.

The East Cornwall Order

The Special Orders Committee of the House of Lords met on December 6th to consider a number of Special Orders granted to electricity undertakings. Lord Onslow presided. The Orders in question were the Leek (Extension); Hereford (Extension); Dunoon (Extension); East Cornwall, Honiton, Ottery St. Mary and District (Extension); Shropshire, Worcestershire and Staffordshire; and Ormskirk Orders.

On the East Cornwall Order Lord Marks asked why in this Order the maximum price was 10d. per kWh, whereas in the Dunoon Order it was 9d. and in the Ormskirk Order only 8d. Mr. D. S. Cumberlege, of the Ministry of Transport, said he thought the answer was that circumstances in individual cases were always given the fullest consideration.

Lord Lamington asked if the same company had not promoted a Bill some years ago which was thrown out. Mr. Cumberlege replied in the affirmative and also agreed that the present Order was drafted on the same lines.

Lord Marks pointed out that the standard dividend was 8 per cent., but the company could pay up to 13 per cent. before it was obliged to reduce the price from 10d. to 7½d. Was that the standard way of reducing the price? Mr. Cumberlege said that the Order contained the standard form of sliding scale between price and dividend.

The chairman suggested that consideration of the Order might be adjourned, but Lord Marks said that if the Order was in the usual form he would not pursue the matter.

All the Orders were accordingly reported to the House for affirmative resolutions.

Railway Electrification

On December 11th Mr McEntee asked the Minister of Transport whether any proposals had been submitted by the London and North-Eastern Railway Company for the electrification of the services from Liverpool Street to Chingford, Liverpool Street to Enfield, Liverpool Street to Ongar, or any of these routes.

Lieut.-Colonel Headlam, who replied, said that the railway companies had informed the Minister that the schemes for the electrification of the Great Eastern suburban services at present under consideration included the electrification of the lines between Liverpool Street and Ongar, but not those between Liverpool Street and Chingford or Enfield.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

M.R.C., Ltd.—Private company. Registered December 4th. Capital, £12,000 in 10,000 8 per cent. cumulative preference shares of £1 each and 40,000 ordinary shares of 1s. each. Objects: To carry on the business of inventors, buyers, sellers, licensees, users and manufacturers of and agents for power transmission mechanism (including mechanism for remote control of devices or objects), &c., and to adopt an agreement with A. F. H. S. Simpson and A. S. Flood. The subscribers are: Mrs. M. W. Furneaux, 76, Norfolk House Road, S.W.16; and C. Haines, 37, Benhill Road, S.E.5. Solicitors: Garton & Co., 21, Maddox Street, W.1.

Sowerby Bridge Relay Services, Ltd.—Private company. Registered December 6th. Capital, £3,000 in £1 shares (1,000 8 per cent. cumulative preference and 2,000 ordinary). Objects: To carry on business as electrical, radio and general engineers, to construct, equip and establish stations for receiving, transmitting and relaying radio entertainments, &c. The permanent directors are: H. A. Close, Uplands, Manygates Lane, Wakefield; S. Flowitt, 8, Windsor Road, Doncaster; C. E. Claridge, 27, Altar Drive, Bradford. Secretary: C. E. Claridge. Solicitors: W. H. Boocock & Son, Penny Bank Chambers, Sowerby Bridge.

Kelvin Batteries, Ltd.—Private company. Registered December 7th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in accumulators, &c. The directors are: J. D. Hargreaves, Ravenswood, Ravenhill, Swansea, and E. C. Phillips, 3, Nicholl Street, Swansea.

Lescum Manufacturing Co., Ltd.—Capital, £6,000 in 5,000 7½ per cent. cumulative preference shares of £1 each and 10,000 ordinary shares of 2s. each. The company was incorporated in the Isle of Man on October 2nd, 1933, to acquire from L. F. Cummins a design respecting improvements in electric water heaters, and to carry on the business of manufacturers of electrical goods and articles, &c. The registered office is at 61, Strand Street, Douglas, I.O.M. The British address is Stradella Road, Herne Hill, S.E.24. Robert J. Boning, 59, New Oxford Street, W.1, is authorised to accept service of process and notices on behalf of the company. The directors are: L. F. Cummins, 7, Cedarville Gardens, Streatham, S.W.16; and F. C. McIntyre, 7, Leigham Court Road, Streatham, S.W.16.

Westhoughton Relays, Ltd.—Private company. Registered December 5th. Capital, £500 in £1 shares. Objects: To construct and maintain wireless signal stations and all other stations for the reception or distribution of wireless or radio signals or waves. The directors are: A. R. Hallows, 13, Thorns Road, Astley Bridge, Bolton; C. V. Case, Sefton Fold Cottage, Horwich; W. Hallows, 8, Market Street, Little Lever; J. Bromilow, Sefton Fold Farm, Horwich; and J. W. Millington, 123, Seymour Road, Astley Bridge, Bolton.

A.R.T., Ltd.—Private company. Registered December 7th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of, agents for and dealers in wireless, magnetic, galvanic and electrical goods, appliances and apparatus, batteries, accumulators, gramophones, &c. The subscribers are: M. Essex and Rose Essex, both of 8, Broadway, W.13. Secretary: Lottie Weiner. Registered office: 53, Farringdon Road, E.C.1.

Radio Resistor Co., Ltd.—Private company. Registered December 7th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless apparatus, sets, units, kits, components and accessories, &c. The subscribers are: S. L. Lewis, 102, Bishopsgate, E.C.2, E. G. Cribb, 15, Honor Oak Road, S.E.23. Registered office: 1, Golden Square, W.1.

Cliff Radio Services, Ltd.—Private company. Registered December 7th. Capital, £400 in £1 shares. Objects: To carry on the business of electrical, radio and general engineers, &c. The permanent directors are: R. L. Latham, Langroyd, Middlestown, near Wakefield, and three others. Registered office: Cliff Cottage, Middlestown, near Wakefield.

H. Retallick, Ltd.—Private company. Registered November 23rd. Capital, £300 in 1s. shares. Objects: To carry on the

business of electrical engineers, electricians, workers and dealers in electricity and radio apparatus and accessories, cabinet makers, &c. The subscribers are: H. Retallick and Mrs. Leila Retallick, both of 14, Station Road, Portslade. The first directors are to be appointed by the subscribers. Secretary: H. Retallick. Registered office: 14, Station Road, Portslade, Sussex.

Ernest Hey, Ltd.—Private company. Registered December 8th. Capital, £500 in £1 shares. Objects: To carry on the business of radio dealers, radio equipment manufacturers and repairers, battery manufacturers and repairers and dealers, &c. The directors are: E. Hey and Mrs. A. M. Hey, both of Kirkroyd, Skipton Road, Colne. Registered office: 1, 3 and 5, Duke Street, Colne.

Jean's Dream, Ltd.—Private company. Registered December 9th. Capital, £200 in £1 shares. Objects: To carry on the business of a telephone, telegraphic, cable and wireless communication company. The subscribers are: W. C. Littlewood, 100, Torridon Road, Catford, S.E.6; and V. M. Yates, 17, Worfield Street, S.W.11. Solicitor: B. T. Kenward, 3, New Square, Lincoln's Inn, W.C.2.

Corke's Radio, Ltd.—Private company. Registered December 8th. Capital, £5,000 in 4,600 shares of £1 and 4,000 shares of 2s. each. Objects: To carry on the business of wireless and electrical dealers and engineers as now carried on by W. Corke & Sons, Ltd., at Salop Street, Wolverhampton. The directors are: E. G. Foster, Woodside, Stockwell End, Wolverhampton; L. E. Willson, Dantetre, Warstone Road, Penn; and D. G. Foster, 4, Rendeford Lane, Tettenhall. Registered office, 105, Salop Street, Wolverhampton.

Returns of Electrical Companies

W. H. Agar, Ltd.—Debenture dated November 30th, 1933, to secure £580, charged on the company's property and undertaking, including uncalled capital. Holder: J. H. Van Ryn, The Lodge, Beaconsfield Road, Willesden, N.W.

Lowe & Oliver, Ltd.—Particulars filed of debentures not exceeding £2,000 authorised November 25th, 1933, charged on the company's undertaking and property, present and future, the amount of the present issue being £2,000.

British Electric Traction, Ltd.—Capital, £2,998,397 15s. in £712,744 5s. 6 per cent. cumulative participating preference stock, £1,326,263 10s. 8 per cent. non-cumulative preferred ordinary stock, £405,778 deferred ordinary stock, 287,256 £1 6 per cent. cumulative participating preference shares, and 266,356 £1 ordinary shares. Return dated July 4th, 1933. All the preference, preferred ordinary and deferred ordinary stock issued and fully paid up. Mortgages and charges, £1,643,190 14s. 11d.

Dixon Bros. & Wood, Ltd.—Capital, £1,500 in £1 shares. Return dated July 6th, 1933. All shares taken up. £1,023 paid. £477 considered as paid. Mortgages and charges, nil.

E. Saunders (Margate), Ltd.—Capital, £3,000 in £1 shares. Return dated July 17th, 1933. Twenty shares taken up. £20 paid. Mortgages and charges, nil.

Gayton Park Electricity Co., Ltd.—Capital, £3,000 in £1 shares. Return dated December 31st, 1932 (filed August 30th, 1933). All shares taken up. £3,000 considered as paid. Mortgages and charges, nil.

Electrical Finance & Securities Co., Ltd.—Satisfaction to the extent of £4,300 on October 31st, 1933, of trust deeds dated July 29th, 1927, July 6th, 1928, April 24th, 1930, and January 29th, 1932, and registered July 29th, 1927, July 10th, 1928, April 29th, 1930, and February 1st, 1932, securing debenture stock.

John Bennie, Ltd.—Issue on November 22nd, 1933, of £500 debentures, part of a series already registered.

Revo Electric Co., Ltd.—Capital, £180,000 in 70,000 preference and 110,000 ordinary shares of £1 each (increased from £175,000 on November 16th, 1933). Return dated July 3rd, 1933. 47,603 preference and 105,000 ordinary shares taken up. £149,193 1s. paid (£1 per share on 101,456 ordinary and 47,203 preference, 11s. 6d. per share on 494 ordinary, and 12s. 6d. per share on 400 preference shares). £3,050 considered as paid on 3,050 ordinary shares. Mortgages and charges, nil.

Electric Agencies, Ltd.—Capital, £2,000 in £1 shares. Return dated July 5th, 1933. All shares taken up. £2,000 paid. Mortgages and charges, nil.

B. E. I., Ltd.—Capital, £1,000 in £1 shares. Return dated August 8th, 1933. All shares taken up. £1,000 paid. Mortgages and charges, £1,000.

British Arc Welding Co., Ltd.—Capital, £50,000 in £10 shares. Return dated June 6th, 1933. 1,474 shares taken up. £12,740 paid. £2,000 considered as paid. Mortgages and charges, nil.

Pacific & European Telegraph Co., Ltd.—Capital, £100,000 in £10 shares. Return dated June 5th, 1933. All shares taken up. £100,000 paid. Mortgages and charges, £66,500.

City Notes

Tube Investments, Ltd.—Presiding at the annual meeting on December 6th, Mr. Arthur Chamberlain (chairman) said that the reorganisation of their electrical business had proceeded smoothly with very encouraging results, but the fact that the electrical trade had not yet participated in the general trade improvement accounted for the necessity of recording that at the end of July last they could not say with certainty that the electrical branch of their business had turned the corner. Excellent work had been done which would undoubtedly be reflected in their next year's accounts.

John I. Thornycroft & Co., Ltd.—Presiding at the annual meeting held on December 8th Sir John E. Thornycroft (managing director), in the course of his speech, said that they were one of the earliest companies to supply trolley-buses, and some of the first they supplied were still giving good service. They were working with the Brush Electrical Engineering Co., Ltd., on this class of business, and recently had supplied sample vehicles to two corporations after extended and satisfactory trials. They looked forward to further business in this direction.

Edmundson's Electricity Corporation, Ltd., reports that during November the electrical energy generated and purchased totalled 49,011,000 kWh, as compared with 40,611,000 kWh in the corresponding month of 1932, an increase of 21 per cent. The total for the first eleven months of the current year was 427,831,000 kWh, against 356,313,000 in the corresponding period of 1932, an increase of 20 per cent.

The International Paper & Power Co. reports that the consolidated gross sales in the third quarter of the current year amounted to $37,329,985, as compared with $30,249,610 in the corresponding period of last year. The net profit was $431,259 (against a net loss of $3,001,567). The net loss for the first nine months of the year was $3,343,231.

Berry, Wiggins & Co., Ltd., have published particulars of an issue of £125,000 of 5½ per cent. first mortgage debenture stock which the Charterhouse Investment Trust, Ltd., has agreed to purchase at 97 per cent. The proceeds of the issue will, after meeting the company's indebtedness to its bankers, leave available additional working capital to the extent of about £40,000, which will be utilised for the development of the business.

Radiovisor Parent, Ltd., reports a loss for the year ended March 31st last of £13,528, increasing the debit balance to be carried forward to £65,542. The debit includes £6,820, being the cost to the company of the legal action brought by Radiovisor Foreign & Colonial, Ltd. The loss on trading for the year was £4,645, as compared with a loss of £6,502 for the seven months to March 31st, 1932. Meeting: December 20th.

The Electric Furnace Co., Ltd., has declared interim dividends for the half-year ended September 30th last of 3½ per cent. on the cumulative preferred ordinary shares and 2½ per cent. on the ordinary shares.

The Compania Hispano-Americana de Electricidad ("Chade") has announced an interim dividend of 20 Argentine paper pesos on the "A," "B" and "C" shares, and 4 Argentine paper pesos on the "D" and "E" shares. Last year the same rates were paid in gold pesetas.

The Scottish Power Co., Ltd., has decided to offer as rights to ordinary shareholders one £1 6 per cent. cumulative preference share at 24s. per share for every eight ordinary shares held. At a meeting held on December 7th proposals for increasing the capital to £6,000,000 by the creation of 1,000,000 shares of £1 each were approved.

Parsons' Foreign Patents Co., Ltd., reports for the year ended June 30th last receipts of £3,978 and a net profit of £619 (against £2,603). To the net profit is added £782 brought in, making £1,401, which it is proposed to carry forward. The report states that adverse conditions on the Continent continue, but since the close of the year there have been indications of improvement.

Companies Struck off the Register.—The names of the following companies have been struck off the Register and they are thereby dissolved:—Abba Electrical Co., Ltd.; British Radio Valve Service, Ltd.; International Radio & Electrical Corporation, Ltd.; Terminus Radio (Victoria), Ltd.

W. & T. Avery, Ltd., have announced an interim dividend of 5 per cent., less tax, on the ordinary shares (same).

Stocks and Shares

TUESDAY EVENING.

THE tendency in the Stock Exchange markets continues to be determined to some extent by the fluctuations in the value of the dollar, and also in that of the franc. New issues find a ready home, provided that the rate of interest, or the prospective dividend, is attractive. It is noticeable, however, that the rush for investment securities has been checked to some extent as compared with what it was a few weeks back. The prices of the latest issued stocks and shares are well maintained as a whole. There is, however, a less insistent demand, and this factor makes itself felt amongst the gilt-edged markets, as well as in the others that offer stocks and shares upon which the dividends are variable.

Public Boards' Stocks

Central Electricity Board 5 per cent. stocks, of both classes, are down a point in company with the securities of various other public boards and Government stocks. On the other hand, London Passenger Transport "B," which carries a 5 per cent. interest at 118¼, is the fraction higher, recovering, that is to say, part of the interest deducted last week. The price of the "C" stock at 82 shows a gain of 2, upon the resumption of speculative-investment inquiry from those who look for a dividend of anything between 3 and 5 per cent. in respect of the current twelve months. As already mentioned, the pessimists profess to look for no dividend at all for this period, while the optimists think that 5 per cent. will be distributed. Home Railway stocks are in better fettle than they have been of late, the principal feature being the strength of Southern Railway stocks, in consequence of the electrification developments that are taking place on the system.

Home Electricity Supply

The recent action of the Union Cold Storage directors in proposing a reduction in the rates of dividend at present being paid to the three classes of preference shareholders, giving a cash payment by way of compensation, has had a disturbing effect upon proprietors of preference shares on which the rates of dividend are 6 per cent. to something higher. The Union

Cold Storage affair is still in abeyance, although the directors obtained sufficient proxies to carry their proposals. Whatever may happen, the result is bound to be far-reaching. Probably, however, the nervousness has gone too far. There are very few companies, it may be safely surmised, that would venture to suggest a reduction in the rate of dividend on their preference shares, with or without cash compensation, unless the articles gave full power for this to be done. Holders of preference shares may feel reassured of the security of their investments. As regards the ordinary shares in the London electricity supply companies, the dividends on which are fixed by a standard scale, no qualms at all need be entertained as to their stability. The prices of shares in this group are unaffected by considerations that have aroused anxiety amongst preference shareholders. The rates of dividend are safeguarded by the Act under which the distributions become standardised.

Electricity Supply Shares

The list of prices is unchanged from that of a week ago, save for $\frac{1}{8}$ decline in Electric Supply Corporation shares, and an equal improvement, to $3\frac{1}{8}$, in North Metropolitans. There are some people who look for the minimum 7 per cent. dividend to be raised to $7\frac{1}{2}$ per cent. for the twelve months now ending, but the more cautious view is to regard this rate as likely to be repeated for 1933, although in 1934 a general increase may become possible. Reference to our tables will show that the yield on the money to be obtained from London electricity supply ordinary shares at the present figures is about $4\frac{1}{2}$ per cent., a rate the modesty of which testifies more eloquently than anything else could do to the confidence with which investment views the group. Scottish Power ordinary shares are quoted ex the rights to the new issue of preference shares. The latter were offered at 24s.; the price is 4s. 6d. premium over and above this. The new West Devons are 1s. 6d. premium. London Power new 4 per cent. debenture is quoted at 15s. premium.

It is a sign of the times that the Reading Corporation has just borrowed £350,000 from a bank, in order to provide part of the purchase price of the town's electricity undertaking. The loan will run for twenty years at $3\frac{1}{2}$ per cent.

Manufacturing and Equipment

A further rally of 2s. 6d. in Associated Equipment Company's shares has lifted the price to 31s., not far short, that is to say, of the quotation at which the shares first became marketable. It is expected that the Underground Electric Railways Company of London will distribute, this week, the dividend arising out of the sale of the Associated Equipment shares which the Underground held prior to its liquidation.

Henleys are dull at $6\frac{1}{8}$. Apart from this, no particular change has occurred in the list of shares in the manufacturing and equipment companies. General Electric preference at 31s., are now ex dividend. Electric Constructions have changed hands at 8s. 9d. and 9s. Enfield Rolling Mills, after being 28s. 6d., rallied to 29s. Hall's Telephone Accessories are better at 20s. 3d., and a slight improvement occurred in Telephone Rentals at 7s. 9d. International Automatic Telephones are quoted at 35s. 6d., the "B" deferred shares at 33s. 9d. Lissen preference have come into request at 23s. 6d. Ever Ready Trusts keep at about 21s. 9d. Philips Incandescent Lamps have improved to 48s.

Cables and Wireless

After the continued depression in the stocks of the Cables & Wireless trio, there is satisfaction in being able to point to a recovery that has reached 6 points in the case of the 5½ per cent. preference stock, and of a point or more in those of the two ordinary stocks. In the Stock Exchange market, it is contended that the prices gave way for no reason other than that of being subjected to a little selling pressure by disappointed shareholders, and that, upon cessation of these sales, the recovery is normal enough in the circumstances. Globe Telegraphs are unchanged, neither ordinary nor preference so far following the recovery in Cables & Wireless. Anglo-American Telegraphs keep their previous prices, and Great Northern Telegraphs strengthened to $32\frac{1}{2}$.

American Industrials

American Telephone & Telegraph has gained 5 points, rising to $117\frac{1}{2}$. While the outlook in the United States continues to be obscure, there is inquiry on this side for shares in American utility companies that have fallen severely in price. Buyers are on the lookout for shares in which there seems scope for recovery when the dollar settles down into a state of greater stability. American Telephone & Telegraph common stock has been as high as $134\frac{3}{4}$ this year, and as low as $86\frac{1}{2}$, New York prices in each case. The extremes of International Telephone & Telegraph this year are $21\frac{3}{4}$ and $5\frac{1}{4}$. The current London price is about $13\frac{1}{2}$. Western Union Telegraphs, which were down at one time earlier in the year to $17\frac{1}{4}$ New York, a drop of 60 points from the best during this same period, are now $55\frac{1}{2}$. It may be repeated that there is still a measure of uncertainty felt in this country as to the way in which American utility companies are likely to fare under the Roosevelt policy aimed at raising the prices of products for the benefit of the seller. Whether a utility corporation would be able to put up its prices correspondingly, is a matter upon which doubt is expressed.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1931.	1932.	Price, Dec. 12.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	78/3	—	3 17 0
Brompton Ordinary	1	8½	7	34/-	—	4 2 4
Charing Cross Ordinary	1	8½	7	34/6	—	4 1 2
Chelsea	1	8⅞	7	34/-	—	4 2 4
City of London	1	10	10	35/-	—	4 0 0
Clyde Valley	1	7	7	40/-	—	3 10 0
County of London	1	10½	10½	55/-	—	3 12 8
Edmundson's 7% Pref.	1	7	7	34/-	—	4 2 4
Elec. Dis. Yorkshire	1	9	9	46/3	—	3 18 0
Elec. Supply Corporation	1	11	11	77/6	—⅛	2 16 6
Kensington Ordinary	1	8	7	34/-	—	4 2 4
Lancs Light and Power	1	7	7	35/-	—	4 0 0
London Electric	1	9	7	34/6	—	4 1 2
Metropolitan	1	10	10	52/6	—	3 16 0
Midland Counties	1	7	7	37/-	—	3 15 8
Mid. Elec. Power	1	8	8	45/-	—	3 11 1
North Eastern Electric Ordinary	1	6	6	34/-	—	3 10 8
Do. 7% Pref.	1	7	7	34/-	—	4 2 4
Northampton	1	10	10	55/-	—	3 12 9
Notting Hill 6% Pref.	10	6	6	13⅝	—	4 8 11
North Met. Elec. 6% Pref.	1	6	6	30/-	—	4 0 0
St. James' and Pall Mall	1	8	7	34/-	—	4 2 4
Scottish Power	1	8	8	2	—	4 0 0
South London	1	8½	7	34/6	—	4 1 2
Westminster Ordinary	1	8½	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	18/9	+⅛	8 0 0
Yorkshire Elec.	1	8	8	46/3	—	3 9 3
PUBLIC BOARDS.						
Central Electricity, 1950–70	Stock	5	5	113	—1	4 8 6
Do. 1955–75	,,	5	5	114	—1	4 7 6
Do. 1951–73	,,	4½	4½	106	—	4 5 0
Do. 1963–93	,,	—	5½	93	—	3 15 3
London & Home Counties, 1955–75	,,	4½	4½	110	—	4 1 10
London Passenger Transport, A	,,	—	4½	114½	—	3 18 7
Do. do. B	,,	—	5	118½	+½	4 4 5
Do. do. C	,,	—	—	82	+2	—
West Midlands Joint Elec. 1948-68	,,	—	5	114	—	4 7 6
TELEGRAPH AND TELEPHONES.						
American Tel. & Tel.	$100	9	9	117½	+5	7 13 3
Anglo-Am. Tel. Pref.	Stock	6	6	113½	—	5 4 0
Do. Def.	,,	1½	1½	29½	—	5 1 8
Cables & Wireless 5½% Pref.	,,	2¾	2¾	74½	+6	3 13 10
Do. A 7½% Ord.	,,	Nil	Nil	24½	+2½	—
Do. B Ord.	,,	Nil	Nil	11	+1	—
Globe Tel. and T. Ord.	10	Nil	2½	10	—	2 10 0
Do. do. Pref.	10	6	6	12	—	5 0 0
Great Northern Tel.	10	20	20	32½	+½	6 3 0
Marconi-Marine	1	10	7½	27/6	—	5 9 1
Oriental Telephone Ord.	1	12	12	3⅛	—	*3 18 4
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	3/3	—	—
Do. do. 2nd Pref.	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	6	—	—
British Electric Traction Df. Ord.	,,	5	5	450	—	—
Do. do. Pref. Ord.	,,	8	8	144½	—	5 10 9
Brazil Traction	100	—	—	11¾	+⅜	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	102½	—½	4 17 7
Mexico Trams, 5% Bonds	—	5	5	27½	—	18 3 8
Mexican Light Common	100	Nil	Nil	5½	—2	—
Do. 7% Pref.	100	7	7	11	—	—
Do. 1st Bonds	—	5	5	40	—	12 10 0
Victoria Falls Ord.	1	15	20	5⅞	—	3 19 0
Yorkshire (West Riding)	1	Nil	Nil	15/-	—	—
MANUFACTURING COMPANIES.						
Assoc. Elec. Ord.	1	4	4	17/9	—	4 10 4
Do. Pref.	1	8	8	33/3	—	4 16 6
Babcock & Wilcox	1	14	9	39/6	+1/3	—
British Aluminium Ord.	1	5	5	27/-	—	3 14 2
British Insulated Ord.	1	15	15	72/6	—	4 2 8
Brush Ord.	Stock	Nil	Nil	40	—	—
Callender's	1	15	15	63/9	—	4 14 4
Do. 6½% Pref.	1	6½	6½	31/3	—	4 3 2
Crompton Parkinson Ord.	5/-	22½	12½	22/6	—	—
Do. 8% Pref.	1	8	8	31/3	—	5 2 5
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	6 2 5
Do. 5% Deb.	Stock	5	5	102½	—	4 17 7
Electric Construction	1	Nil	Nil	10/-	—	—
Enfield Cable Ord.	1	25	25	92/6	—	5 7 5
English Electric	1	Nil	Nil	7/6	—	—
Do. do. Pref.	1	Nil	Nil	11/3	—	—
Ever Ready	5/-	35	35	29/-	—	6 0 8
Ferranti Pref.	1	7	7	28/-	—	5 0 0
G.E.C. Pref.	1	6½	6½	31/- xd.	—1/-	4 3 10
Do. Ord.	1	8	8	42/6	—	3 15 3
Henley's	1	30	30	6¼	—⅛	4 17 10
Do. 4½% Pref.	5	4½	4½	5½	—	4 5 9
India-Rubber Preferred	1	—	—	15/-	—	—
Johnson & Phillips	1	5	5	19/6	—	5 2 7
Siemens Ord.	1	7½	6½	20/-	—	—
Telegraph Construction	£1	Nil	Nil	28/9	—	—

* Dividends paid free of Income Tax

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1932

4217. "Resistance-coupled thermionic amplifiers." Dubilier Condenser Co. (1925), Ltd. February 12th, 1931. (401673.)

4420. "Synchronous machine coupled to a prime mover or to a driven machine." Siemens-Schuckertwerke Akt.-Ges. June 20th, 1931. (401664.)

7572. "Protective systems for electric distribution systems." International General Electric Co., Inc. March 12th, 1931. (401701.)

13274. "Electrical indicating devices." W. J. Linggood. May 9th, 1932. (401655.)

13751. "Rotary converter, and motor generator voltage regulation methods." E. J. Timberlake and Electro Dynamic Construction Co., Ltd. May 13th, 1932. (401671.)

13812. "Automatic regulation of the excitation of alternating-current machines." Brush Electrical Engineering Co., Ltd., J. S. Messent, and C. C. Sutton. May 13th, 1932. (401713.)

13931. "Electric incandescent lamps." J. Stone & Co., Ltd., and J. F. B. Vidal. May 14th, 1932. (401658.)

13932. "Train-lighting dynamos." J. Stone & Co., Ltd., and A. L. Ash. May 14th, 1932. (401659.)

14073. "Telephone systems." Automatic Electric Co., Ltd., G. T. Baker, F. T. Belas and C. E. Beale. May 17th, 1932. (401695.)

14119. "Electric storage batteries or accumulators." Drumm Battery Co., Ltd., J. J. Drumm and A. G. Burnell. May 18th, 1932. (Addition to 365125.) (401717.)

14240. "Cathode-ray tubes." M. Von Ardenne and S. Loewe. May 23rd, 1931. (401727.)

14245. "Wireless signalling systems." Standard Telephones & Cables, Ltd. May 20th, 1931. (401728.)

14246. "Alternating-current signalling systems." Standard Telephones & Cables, Ltd., and T. S. Skillman. May 19th, 1932. (401729.)

14247. "Carrier-wave communication systems." Standard Telephones & Cables, Ltd. May 21st, 1931. (401730.)

14339. "Apparatus for the generation of electric high-voltage impulses." T. E. Allibone and Associated Electrical Industries, Ltd. May 20th, 1932. (401737.)

14340. "Arrangements for the potential grading of electric discharge tubes." T. E. Allibone and Associated Electrical Industries, Ltd. May 20th, 1932. (401738.)

14349. "Electric discharge devices such as thermionic valves." S. P. De Laszlo. May 20th, 1932. (401740.)

14598. "Sound-reproducing devices." Electrical Research Products, Inc. July 22nd, 1931. (401751.)

15453. "Sleeving for electric conductors." London Electric Wire Co., and Smiths, Ltd., and S. B. Klein. May 31st, 1932. (401772.)

15623. "Thermionic valves." M. O. Valve Co., Ltd., and E. C. R. Gant. June 2nd, 1932. (401773.)

16735. "Means for preventing disturbances in wireless apparatus using rotary convertors." N. Pensabene. June 14th, 1932. (401782.)

17835. "Wireless receiving apparatus and circuits therefor." F. Thistlethwaite. June 24th, 1932. (401791.)

17929. "Electrical illuminating apparatus." British Thomson-Houston Co., Ltd. June 26th, 1931. (401793.)

18360. "Electric signalling systems." General Electric Co., Ltd., H. R. Noble and E. P. L. Westell. June 29th, 1932. (401795.)

18624. "Electrical selective systems." Siemens Bros. & Co., Ltd., and D. A. Christian. July 1st, 1932. (401798.)

19469. "Electrical fire alarms." Vigilant Automatic Fire Alarm Co., Ltd. July 10th, 1931. (401805.)

19481. "Electrical switch contacts." Aron Electricity Meter, Ltd., and E. J. Riordan. July 9th, 1932. (401806.)

19561. "Electric lampholders." General Electric Co., Ltd., and W. F. S. Debenham. July 11th, 1932. (401807.)

19795. "Automatic or semi-automatic telephone exchange systems." General Electric Co., Ltd., and J. E. Collyer. July 13th, 1932. (401811.)

19980. "Electric projector lamps for railway signalling or similar purposes." British Power Railway Signal Co., Ltd., Railway Supplies Co., Ltd., S. L. Glenn and E. E. Pierce. July 14th, 1932. (401812.)

20196. "Electric discharge rectifying apparatus." British Thomson-Houston Co., Ltd. July 16th, 1931. (401815.)

20772. "Portable electric searchlight apparatus." R. S. Richards. July 23rd, 1932. (401819.)

21070. "Electric acoustic devices." Moto Meter Gauge & Equipment Corporation. August 8th, 1931. (401823.)

21689. "Electric discharge devices." International General Electric Co., Inc. August 1st, 1931. (401828.)

23725. "Windings for ignition coils and magneto armatures." British Thomson-Houston Co., Ltd., and C. J. Morton. August 24th, 1932. (401836.)

24111. "Lighting fittings." General Electric Co., Ltd., and W. F. S. Debenham. August 29th, 1932. (401838.)

24160. "Means for heating chicken incubators, hovers, or brooders by electricity." H. Burrows. August 30th, 1932. (Cognate application, 31991/32.) (401839.)

24669. "Arc-welding systems." H. D. Pitzpatrick (L. E. Widmark). September 5th, 1932. (401845.)

24713. "Electric discharge lamps." General Electric & Co., Ltd., and J. W. Ryde. September 5th, 1932. (401846.)

24876. "Method of improving the characteristics of alternating-current dynamo-electric machines having compounding devices." Brush Electrical Engineering Co., Ltd., and J. S. Messent. September 7th, 1932. (401848.)

26137. "Electrical circuits for multiple channel signalling systems." General Electric Co., Ltd., and D. C. Espley. September 20th, 1932. (401854.)

27461. "Thermionic valves." Telefunken Ges. für Drahtlose Telegraphie. October 3rd, 1931. (401859.)

28750. "Electric motors." Warren Telechron Co. October 19th, 1931. (401872.)

28798. "Electromagnetic relays." General Electric Co., Ltd., and J. Eriksen. October 15th, 1932. (401873.)

29533. "Cut-out means employed in the charging of electric batteries." H. Huntbach. October 22nd, 1932. (401877.)

31958. "Electric motors." British Thomson-Houston Co., Ltd. November 11th, 1931. (401885.)

32630. "Electric lamps." British Thomson-Houston Co., Ltd. November 18th, 1931. (401891.)

33667. "Protection of transforming devices with grid-controlled discharge devices." International General Electric Co., Inc. November 28th, 1931. (401894.)

34517. "Prevention of interference in wireless receiving apparatus." J. Bradford. December 6th, 1932. (401895.)

35151. "Dual-wave inductance coils." F. N. Waters. December 12th, 1932. (401899.)

35682. "Arrangement for the feeding of current to gaseous discharge luminous tubes." Aktiebolaget Ingeniorsfirman Teknik. September 16th, 1931. (401903.)

36432. "Control system for low-pressure gaseous electric discharge apparatus." Akt.-Ges. Brown, Boveri et Cie. December 28th, 1931. (Addition to 29744/32.) (401906.)

1933

2782. "Ignition devices for internal-combustion engines." B. Howell and C. B. Hansen. July 28th, 1932. (401915.)

3605. "Apparatus for converting alternating electric current into alternating current of lower frequency." Ateliers de Constructions Electriques de Charleroi. February 4th, 1932. (401920.)

3648. "Thermionic valve oscillatory systems." Marconi's Wireless Telegraph Co., Ltd. February 6th, 1932. (401921.)

3734. "Caps and holders for electric discharge tubes and incandescent lamps." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. January 3rd, 1933. (401923.)

4375. "Sound-recording processes." British Thomson-Houston Co., Ltd. February 12th, 1932. (401928.)

4838. "Apparatus for the electrical precipitation of suspended matter from gaseous fluids." Lodge-Cottrell, Ltd. (Research Corporation of New York). February 16th, 1933. (401932.)

7272. "Bases for electric switches." R. Bain and N. Allday. March 10th, 1933. (401939.)

7346. "Electrical generators for water-power stations." International General Electric Co., Inc. March 10th, 1932. (401940.)

9447. "Tele-metering device." Landis & Gyr Akt.-Ges. April 23rd, 1932. (401951.)

9648. "Electric torches." Pertrix Chemische Fabrik Akt.-Ges. February 3rd, 1933. (401953.)

10127. "Automatic electric overload switches." H. Gottschlich and J. Gottschlich. April 5th, 1932. (401957.)

12454. "Electric lamps." British Thomson-Houston Co., Ltd. April 29th, 1932. (401972.)

14066. "Semi-automatic winding machine for producing electrodes for galvanic batteries." W. Hasse. November 8th, 1932. (Addition to 399324.) (401983.)

14296. "Electric measuring instruments." British Thomson-Houston Co., Ltd. May 18th, 1932. (401696.)

15272. "Electric discharge tubes." C. H. F. Muller Akt.-Ges. May 30th, 1932. (Cognate application 15273/33.) (401988.)

15452. "Electrolytic condensers." Magnovox (Great Britain), Ltd. May 28th, 1932. (401989.)

15496. "Television and like systems." Marconi's Wireless Telegraph Co., Ltd. May 28th, 1932. (401990.)

15906. "Railway and tramway cars." S. Dunlop (Fiat Soc. Anon.). June 1st, 1933. (401992.)

16886. "Protective devices for electric circuits." International General Electric Co., Inc. June 15th, 1932. (402003.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections may be entered against any of the proposed marks within one month from December 6th :—

Dædalia. No. 544396. Class 8. Sound reproducing, recording, and transmitting apparatus, radio-telephonic apparatus, television apparatus and parts thereof, &c.—Gordon Osmand, trading as the Dædalia Co., 41, Talgarth Mansions, Kensington, W.14.

Cantella. No. 544931. Class 8. Radio apparatus and parts thereof.—Arjen Adrianus Posthumus, Baarn, Holland (British representatives, Forrest, Ketley & Co., Jessel Chambers, 88-90, Chancery Lane, W.C.2.)

Elm. No. 543461. Class 18. Electric and gas water heaters. —Elm Works, Ltd., Summerstown, Tooting, S.W.17.

Demonstrators' Circle Dance

It was an excellent idea to get together in a social function the members of the Demonstrators' Circle of the Electrical Association for Women who have been so assiduous in attending the Monday evening lectures. This kind of thing is likely to develop the idea of professional status initiated by the granting of diplomas and certificates to which we referred in our issue of November 24th. The removal of the partitions between the club-room and the committee room at No. 20, Regent Street, W. (E.A.W. headquarters), made a very suitable dance hall that quite comfortably accommodated the eighty or so dancers present on December 6th. The guests included those who had given lectures, among whom were Miss E. I. Sprott (B.B.C.) and Councillor Miss H. A. Dutch (Westminster City Council). Miss D. Vaughan organised a most enjoyable evening, for which Miss M. G. Reading acted as hostess.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ashby Woulds.—Houses (50), Moira; Mr. McCarthy, U.D.C. architect, Moira.

Becontree.—Shops, Green Lane; J. G. Tilley.

Beddington & Wallington.—Municipal offices (£24,106); Perrys (Ealing), Ltd., builders.

Bradford.—Houses (446), Cooper Lane; R. J. Patchett, Ltd., builders, Clayton Heights.

Bristol.—Houses (76), Knowle (£21,584), and 20 houses at Southmead (£5,680); John Knox, builders. Isolation hospital, Nover's Hill; city engineer. Extensions, Alexandra Park School (£3,925); Stone & Co. (Bristol), Ltd. Extensions, Upper Horfield School (£4,835); H. J. Walker & Son.

Bromsgrove (WORCESTERSHIRE).—Additions and extensions to the Guardians Institution, electrical work; A. V. Rowe, architect, 38, Foregate Street, Worcester.

Campbeltown.—Houses (250); Neil Ferguson, burgh surveyor, High Street.

Cardiff.—Alterations to Canton cinema, Cowbridge Road; manager.

Cheshire.—Schools, Pensby and Kensall, for County E.C.; county architect, Chester.

Chester-le-Street (DURHAM).—Houses (50), Bullion Lane Estate; U.D.C. surveyor.

Chippenham.—Houses (22); Wallis & Co., builders, Wotton Bassett.

Colchester.—Houses (46), Harwich Road; borough engineer.

Darlaston (STAFFS).—Public baths (£15,000), with electrical work; surveyor, Town Hall.

Doncaster.—Houses (£20,123), Smith Street and Rufford Road; borough surveyor. Cinema, for the Gaumont-British Picture Corporation, Ltd.

Douglas (I.O.M.).—Extensions (£8,000), Brown & Sons, Ltd. (*Isle of Man Times*).

Dundee.—Houses, King Street and Union Street, Broughty Ferry; city architect.

Dunfermline.—Hall for the Carnegie Dunfermline trustees (£24,000); Muirhead and Rutherford, architects.

Dunstable (BEDFORDSHIRE).—Factory near Houghton Road, A.C. Sphinx Sparking Plug Co., Ltd., 242, Bradford Street, Birmingham; E. Howard & Partners, architects, 3, St. James Street, London, S.W.1.

East Lothian.—Houses (166), Prestonpans, Tranent, and Westbarns, for C.C.; county architect, County Buildings, Haddington.

Edinburgh.—Shops and houses, Ashley Terrace, Portobello Road; J. Miller, builder, 88, Hanover Street.

Elgin.—Houses (20); A. A. Turiff, burgh surveyor.

Essex.—School, Kelvedon Hatch, Ongar, for County E.C.; J. Sargent, director of education, Chelmsford. Extensions, Aldersbrook schools (£3,550), and botanical and biological laboratory, Leyton High School for Boys, for County E.C.; J. Stuart, county architect, Chelmsford.

Felling-on-Tyne.—Houses (127), Felling House Estate; C. W. Hall, U.D.C. surveyor.

Glasgow.—Houses (20,000), for the Corporation Housing Committee; housing department, 20, Trongate. Houses, Clarkston Road, for Mactaggart & Mickel, Ltd., 65, Bath Street. Church, Shieldhall, for the Govan United Free Church (continuing).

Gloucester.—Rebuilding Crypt Grammar School, for the United School Governors; clerk.

Greenock.—R.C. Church, and presbytery for St. Patrick's Congregation (£19,000); Clergyman-in-charge.

Guildford.—Houses (72); R.D.C. surveyor. Cathedral, Stag Hill (£175,000); Edwin Maufe, architect, 3, Raymond Buildings, London, W.C.

Hastings.—Houses (24), Old London Road, for G. Fryer; F. Gordon Watford, architect. Houses, Knollhurst Estate, for A. Honnor. Houses (148); borough engineer.

Hemel Hempstead.—Houses (50); borough surveyor.

Houghton-le-Spring.—Houses (61); V. V. Hunter, U.D.C. surveyor.

Hull.—Houses (304), Endyke Lane Estate, and improvements to Victoria Pier (£35,000); city engineer. Thirty-two Flats, New George Street (£9,918); Simms, Sons & Cooke, Ltd. Extensions, Eastfield Road, and Ainthorpe Grove schools; city architect.

Hutton-le-Hole.—Church; Rickaby & Co., builders, Kirbymoorside.

Ilford.—Extensions, King George Hospital (£60,000); Governors.

Irish Free State.—(BALLINA, CO. MAYO).—Hospitals and laundry block, &c., for the Board of Health, Castlebar; P. J. Munden, chartered architect, 1, South Frederick Street, Dublin. (BELMULLET, CO. MAYO).—Hospitals, laundry block, &c., for the Board of Health, County Home, Castlebar; P. J. Munden, chartered architect, 1, South Frederick Street, Dublin. (CLAREMORRIS, CO. MAYO).—Hospital for the Board of Health, Castlebar; P. J. Munden, chartered architect, 1, South Frederick Street, Dublin. (DUNDALK, CO. LOUTH).—Chapel, St. Mary's College; V. J. O'Connell, architect, 15, Earl Street. (SLIGO).—Houses (128); McDonnell, Dixon, & Downes, architects, 20, Ely Place, Dublin. (SWINFORD, CO. MAYO).—Hospital for the Board of Health, Castlebar; P. J. Munden, chartered architect, 1, South Frederick Street, Dublin.

Isle of Wight.—County hall (£50,000), for C.C.; Gutteridge & Gutteridge, architects, Southampton.

Kidderminster.—Houses (40), Broadwaters Estate; borough engineer. Works extension, Coventry Street; G. T. Cheshire & Sons.

King's Heath (BIRMINGHAM).—Church, St. Dunstan, and R.C. schools, for Father Kelly (£12,000), with electrical work.

Kirkcudbright.—Houses (24); W. A. Mackinnell, architect.

Lancashire.—Senior Boys' Council School, Garrett Hall Lane, Tyldesley, for C.C.; G. & J. Seddon, Ltd., builders, 5, Manchester Road West, Little Hulton, near Bolton.

Leeds.—Baths, Meanwood Road (£12,000), and extensions, municipal offices (£7,735); city engineer.

Lewes (SUSSEX).—Factory, Lansdowne Place, for W. Mann & Co.

Liverpool.—Extensions, Aintree, for W. & R. Jacob & Co. (Liverpool), Ltd., 286, Scotland Road (£50,000), with electrical work; Morter & Dobie, architects, 24, Dale Street.

London.—(BALHAM). — Extensions, St. James' Hospital (£26,260); L.C.C. architect. (CATFORD).—Swimming bath, &c., Perry Rise; S. P. Thornett. (EAST HAM).—Alterations to 127, High Street; Upsons, Ltd. (FULHAM).—Extensions, Western Hospital (£17,750); A. Monk, Lower Edmonton, N. (HITHER GREEN).—Extensions, Park Hospital (£33,400); L.C.C. architect. (ISLINGTON).—Tenements, Andover Road (£51,000); L.C.C. architect. (LAMBETH).—Nurses' home, &c., for the Poor Law Hospital (£52,560); L.C.C. architect. (LEWISHAM).—School (700 places), Coopers Lane; L.C.C. architect. (SHOREDITCH).—Tenements, Haggerston Road (£22,600) and Provost Street (£27,000); L.C.C. architect. Reconstruction of Stonebridge Estate (£175,000); borough engineer. (WEST HAM).—Houses (141), Old Canning Town; borough surveyor.

Luton.—Houses (65); borough surveyor. Houses (245), Crawley Green Road, for C. Jeyes, Ltd. Houses (40), St. Augustine Avenue, for A. G. Peck.

Maidstone.—Houses (30), Ringlestone Estate; borough surveyor.

Manchester.—Cinema rooms, Rivoli Cinema, Rochdale Road, Hollyhurst; manager. Factory, Sharston Road, for G. H. Scholes & Co., Ltd. (£10,000), with electrical work; Cruickshank & Seward, architects, 18, Booth Street. School, Rack House Estate, Wythenshawe, for E.C. (£24,945); director of education. Factory for George H. Scholes & Co., Ltd., Blantyre Street, Chester Road.

Newcastle-on-Tyne.—Houses (36), West Road and Silverhill Drive; Marshall & Tweedy, architects, 129, Pilgrim Street. Town Hall for C.C. (£200,000); city architect.

Ongar.—Houses (48); R.D.C. surveyor.

Potters Bar.—Cinema, Darkes Lane; Little Heath Estate, Ltd.

Preston.—Additions to maternity block, Royal Infirmary, Deepdale Road (£20,000), with electrical installations; A. C. M. Lillie, Brown Edge, Bamber Bridge.

Pudsey (NEAR LEEDS).—Houses (389); Harry Emmott, Ltd., builders, 14, King's Arcade, Bradford.

Redditch.—Houses (200), Salters Lane; U.D.C. surveyor, Surveyor's Office, Council House.

Retford.—Houses (20), Ordsall; borough surveyor.

Romford.—Houses (46), Ingrebourne Road; R.D.C. surveyor.

Rotherham.—Houses (250), Eastwood; V. Turner, architect, Municipal Offices. Houses (22), Richard Road; T. Gledhill. Houses (50), Russell Street; Allott & Dunk.

Rowley Regis.—Houses (87), Cradley Heath; borough surveyor.

Sheffield.—Houses (358), Shiregreen Estate; Corporation Estates department. Cinema, Sicey Avenue, Brishes Estate; J. F. Macdonald. Elementary school, Woodrove Avenue, for E.C.

South Elmsall.—Extensions, Warde Aldam Hospital; W. Reeves, architect.

Southend-on-Sea.—Re-erection of rubber factory, Prince Avenue, for Commercial Rubber Products, Ltd.; J. S. Shane, Chalkwell Avenue, managing director.

Southport.—Workshop and garages, Southbank Road; C. T. Nicklin & Sons, Ltd.

Stalybridge.—Houses (29), Chapel Street; O. I. Spedding. Mill extension, Knowl Street; Byrom Winding Co.

Stanley.—Houses (48), Newton Hill; W. Huson, architect.

Stockport.—Radiography block, Stepping Hill Hospital; Peirce & Son, architects, 30, St. Petersgate. Houses (280), Cheadle Heath; borough surveyor.

Stourbridge.—Works extensions, Rufford Street, Lye, for E. Hill & Sons, Ltd.

Surrey.—Hospital, St. Helier Estate, Carshalton, for the P.A.C.; clerk, Kingston-on-Thames. Institution, Botleys Park Estate, for C.C.; clerk, Kingston-on-Thames. Extensions, County Boys' School, Mitcham (£3,613); Ashford Builders, Ltd.

Sutton Coldfield.—Houses (200), Boldmere Road; T. P. Smith, Ltd.

Tewkesbury.—Hospital for the Hospital Committee; secretary.

Twickenham.—Blocks of flats for H. & L. Sloggett, Hampton.

Tyldesley.—Houses (800), Manchester Road, Astley; Green & Son, builders, Broughton Road, Reddish, Stockport.

Tynemouth.—Houses (22), Pineapple Estate; H. D. Burton, builder, King Street, North Shields.

Wakefield.—Houses (44), Flanshaw Lane; G. Crook & Sons, Ltd. Houses (50), Lupset Estate; city architect. Alterations to Coliseum Cinema, Stanley Road; manager. Extensions, Lawefield Lane School; for E.C.

Wallsend.—Houses (84), Archer Street; J. A. Blench, borough engineer.

Wallsall.—Houses (36) and shops, Great Barr Estate (£9,646); Dickinson & Holford, Ltd.

West Riding.—Technical college, Mexborough; H. Wormald, architect, County Hall, Wakefield.

Wiltshire.—County offices, Trowbridge, for C.C.; T. Walker, county architect. Secondary school, Chippenham (£32,000), and senior school, Amesbury-Durrington (£13,000), for County E.C.; director of education, Trowbridge.

Wolverhampton.—Houses (36), Fallings Park Estate; M. A. Boswell. Rebuilding of premises, Bodega Co., Ltd., Dudley Street (£10,000), with electrical work; S. A. Spear Yeo, architect, 2, St. John Street, London, E.C.1.

Worthing.—Houses (62); borough surveyor.

York.—Extensions, Institution infirmary (£97,600); city surveyor.